First Supplemental Environmental and Social Impact Assessment (ESIA)

Proposed Geothermal Project and its Associated Facilities in Nevis – Stages of Exploration and Exploitation

October 2020

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Proposed Geothermal Project and its Associated Facilities in Nevis – Stages of Exploration and Exploitation

Ricardo Calvo
Partner

Isolina Sánchez
Project Manager

ERM Washington
1776 I St NW
Washington DC 20006
Tel: 1-202-466-9090

This First Supplementary ESIA describes exploration and exploitation phases. The current process will finance only the exploration phase, which must be kept in mind while reading the ESIA.

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Acronyms and Abbreviations

°C	Degree Celsius
ACC	Air Cooled Condensers
AD	After Christ
ADI	Area of Direct Influence
AII	Area of Indirect Influence
AOI	Area of Influence
AVR	automatic voltage regulator
BAOI	Biotic Area of Influence
bbls	Barrels of oil
BC	Before Christ
BCPA	Beijing Declaration and Platform for Action
BMCs	Borrowing Member Countries
BMP	Biodiversity Management Plan
BOP	Blow Out Preventer
BOPE	Blow Out Prevention Equipment
CARDI	Caribbean Agricultural Research and Development Institute
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CDB	Caribbean Development Bank
CDSMP	Chronic Disease Self-Management Programme
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CFCs	Chlorofluorocarbons
CH4	Methane
CHS	Community Health and Safety
CIA	Cumulative Impact Assessment
CITES	Convention on the International Trade in Endangered Species
CO	Carbon Monoxide
COVID-19	New Coronavirus
CPA	Country Poverty Assessment
CR	Critically Endangered
CSAMT	Controlled Source Audio-Frequency Magnetotellurics
dB	Decibels
dBA	A-weighted decibels
dBC	C-weighted decibels
DD	Data Deficient
DDR	Daily Drilling Report
DEPPSIP	Department of Economic Planning and Public Sector Investment Planning
DGR	Daily Geological Reports
DOA	Department of Agriculture
DOE	Department of Environment
DOLS	Department Land and Surveys
DPPE	Department of Physical Planning and Environment
DPPNRE	Department of Physical Planning, National Resources and the Environment
EAP	Economically active population
EERE	Energy Efficiency and Renewable Energy (U.S. Department of Energy)
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EN	Endangered
EP	Equator Principles
EPA	United States' Environmental Protection Agency

ERM	Environmental Resources Management
ESG	Environmental, Social and Governance
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plans
ESPII	Public Health Emergency of International Importance
ESRP	Environmental and Social Review Procedures
EU	European Union
F	Fahrenheit
FAMRA	Fisheries, Aquaculture and Marine Resources Act
FAO	Food and Agriculture Organization
FPIC	Free, Prior, and Informed Consent
FREESH	Fund for the Realization of Economic Empowerment through Subsidized Housing
ft	Feet
ft msl	Feet Mean Sea Level
GBIF	Global Biodiversity Information Facility
GCPP	Generator control and protection panel
GDP	Gross Domestic product
GEF	the Global Environmental Fund
GFDRR	Global Facility for Disaster Relocation and Recovery
GHGs	Greenhouse Gases
H&S	Health and Safety
H_2S	Hydrogen Sulfide
Ha	Hectare
HDI	Human Development Index
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IBAs	Important Bird Areas
IBAT	Integrated Biodiversity Assessment Tool
IDB	Inter-American Development Bank
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standards
IGV	Inlet Guide Vanes
ILO	International Labor Organization
IPPC	International Plant Protection Convention
IUCN	International Union for Conservation of Nature
kcmil	thousands of circular mils
km^2	Kilometers squared
KPIs	Key Performance Indicators
kW	Kilowatt
kWe	Kilowatt Electric
kWhr	Kilowatt-hours
LAeq	levels as equivalent
lbs	Pounds
LC	Least Concern
LEL	Lower Explosive Limit
Leq	Sound Level
LTI	Lost Time Injuries
m	Meters
m3	Cubic meters
m3/year	Cubic meters per year
MBT	Monobutyltin
MDGs	Millennium Development Goals
Mg	Milligrams

mm/year	millimeter per year
mph	Miles per hour
MPL	Maximum Permissible Limits
MT	Magnetotelluric
MVA	Mega Volt Amp
MW	Megawatt
MWe	Megawatt Electric
NASPA	Nevis Air & Seaport Authority
NCDs	Non-Communicable Diseases
NCEMA	National Conservation and Environmental Management Act
NCEPA	National Conservation and Environmental Protection Act
NCG	Non-Condensable Gas
NEAP	St. Kitts and Nevis National Environmental Action Plan
NEMA	National Emergency Management Agency
NEP	National Energy Policy
NEVLEC	Nevis Electric Utility
NGOs	Non-Governmental Organizations
NHC	National Housing Corporation
NHCS	Nevis Historical and Conservation Society
NHLDC	Nevis Housing and Land Development Corporation
NIA	Nevis Island Authority
NIOSH	U.S. National Institute for Occupational Safety and Health
NO2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPPA	Nevis Peak Protected Area
NPRS	National Poverty Reduction Strategy
NREI	Nevis Renewable Energy International, Inc.
NREL	National Renewable Energy Laboratory
NT	Near threatened
OAS	Organization of American States
OECS	Organization of Eastern Caribbean States
OHS	Occupational Health and Safety
OP	Operational Policies
OPS/OMS	Pan American Health Organization (for its Spanish acronym)/ Health World Organization (for its Spanish acronym)
ORC	Organic Rankin Cycle
OSHA	U.S. Occupational Safety and Health Administration
PAHO	Pan American Health Organization
PAM	People's Action Movement
PC	Project Contribution
PEC	Predicted Environmental Concentration
PEL	Permissible Exposure Limits
PERB	Eastern Caribbean Region's Biodiversity
pH	Potential of hydrogen
PIA	Point Impact Analysis
PM	Particulate Matter
PM 2.5	Particulate Matter 2.5
PM10	Particulate Matter 10
PPA	Purchase Power Agreement
ppb	Parts per billion
PPE	Personal Protective Equipment
ppm	Parts per million

PPM	Parts Per Million
PS	Performance Standard
PSG	Pressurized Seal Gas
PSIP	Government's Public Sector Investment Program
PWD	Public Works Department
RCRI	Realization of Children's Rights Index
REL	Recommended Exposure Limits
RISE	Restore, Inspire, Serve, Empower
SCADA	Supervisory control and data acquisition
SCBA	Self-Contained Breathing Apparatus
SCNPF	St. Cristopher and Nevis Police Force
SCNT	The Saint Christopher National Trust
SDS	Safety Data Sheet
SEP	Stakeholder Engagement Plan
SIDF	St. Kitts and Nevis Sugar Industry Diversification Fund
SKN	St. Kitts and Nevis
SKNLP	St. Kitts and Nevis Labour Party
SLMP	Sustainable Land Management Project
SO2	Sulfur dioxide
SPAW Protocol	Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean
SPCC	Spill Prevention Control and Countermeasures
STEP	Skills Training and Empowerment Programme
STIs	Sexually Transmitted Infections
SVU	Special Victims Unit
t/h	Tonne (mass) per hour
TEP	Thermal Energy Partners, LLC
TWA	Time Weighted Average
UN-DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNIFEM	United Nations Development Fund for Women
UNODC	United Nations Office on Drugs and Crime
US	United States
US$	United States Dollars
USACE	US Army Corps of Engineers
USD	United States Dollars
UV	Ultraviolet
VECs	Valued Environmental Component
VU	Vulnerable
VWA	Vance W. Amory Nevis Airport
W	Watts
WBG	World Bank Group
WGDC	Whitegate Development Corporation
WHO	World Health Organization
WHSMP	Worker Health and Safety Management Plan
WIPN	West Indies Power Nevis
WSD	Water Services Department
Wt	Weight

XCD	Easter Caribbean Dollar
µg/m3	Microgram per cubic meter air

1. EXECUTIVE SUMMARY

In November 2013, NREI, a consortium of three of the leading geothermal energy developers in the industry, was selected through an open competitive process assisted by the US Department of State and their consultant, Deloitte Consulting Services, to develop 10MWs of geothermal energy for Nevis. On July 1, 2014 a concession agreement was signed. In February 2016, the Purchase Power Agreement was completed and released to NREI, and in March 2016, NREI selected Orion Drilling and HGI for well construction, Clemessy-Turboden as EPC contractor and the preliminary design and costings began.

The Project is being considered to be partially financed by the Caribbean Development Bank through the *Sustainable Energy Facility for the Eastern Caribbean Global Credit Loan* of the Inter-American Development Bank (IDB). As such, the Project must adhere to national guidelines as well as the International Finance Corporation's (IFC) Performance Standards (PS) on Environmental and Social Sustainability (2012) and applicable IFC Environmental, Health, and Safety (EHS) Guidelines, as well as to the IDB Environmental and Social Operational Policies. ERM, an international sustainability consulting firm, was retained to prepare a Preliminary Supplemental Environmental and Social Impact Assessment (ESIA) of the Nevis Geothermal Project, to complement a 2017 EIA and 2020 Addendum carried out by Point Impact Analysis. The organization of this Environmental and Social Impact Assessment (ESIA) corresponds to the two differentiated stages of the proposed project: exploration and power plant construction and operation ("exploitation"), classified as category B and A respectively. The project financiers (IDB and CDB) agreed on this classification, based on an analysis of the likely E&S impacts and risks, which for the exploration drilling stage are considered to be mostly local and short-term. The first stage (exploration) has been classified as Category B+ (in accordance with the E&S impact categorization established in the Operating Manual of the Financiers broader Sustainable Energy Facility for the Eastern Caribbean). There is a considerable level of uncertainty in the resulting power production capacity of the well and consequently, on the final power capacity size of the resulting power plant. The second stage, the construction of the Power Plant, has been tentatively classified as Category A based on the current design, currently available information, and likely E&S impacts and risks.

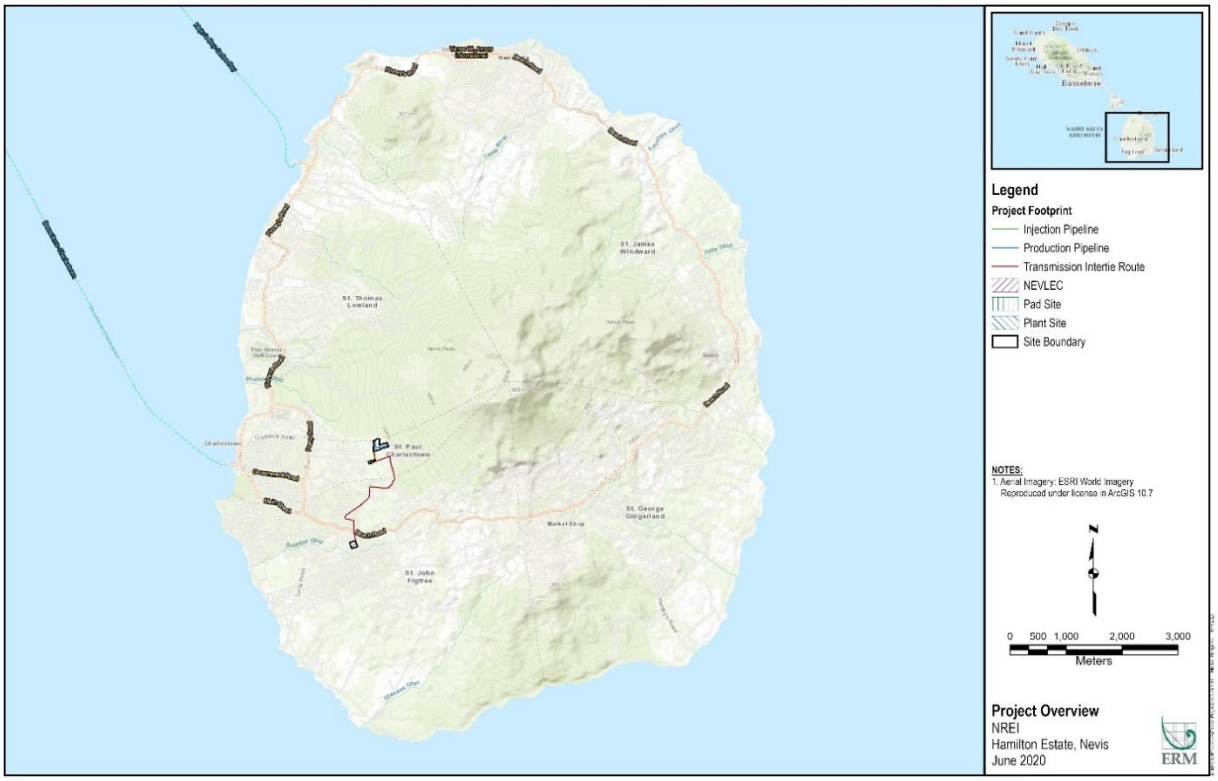


Figure ES-1-1. Project Location

1.1 Project Purpose and Need

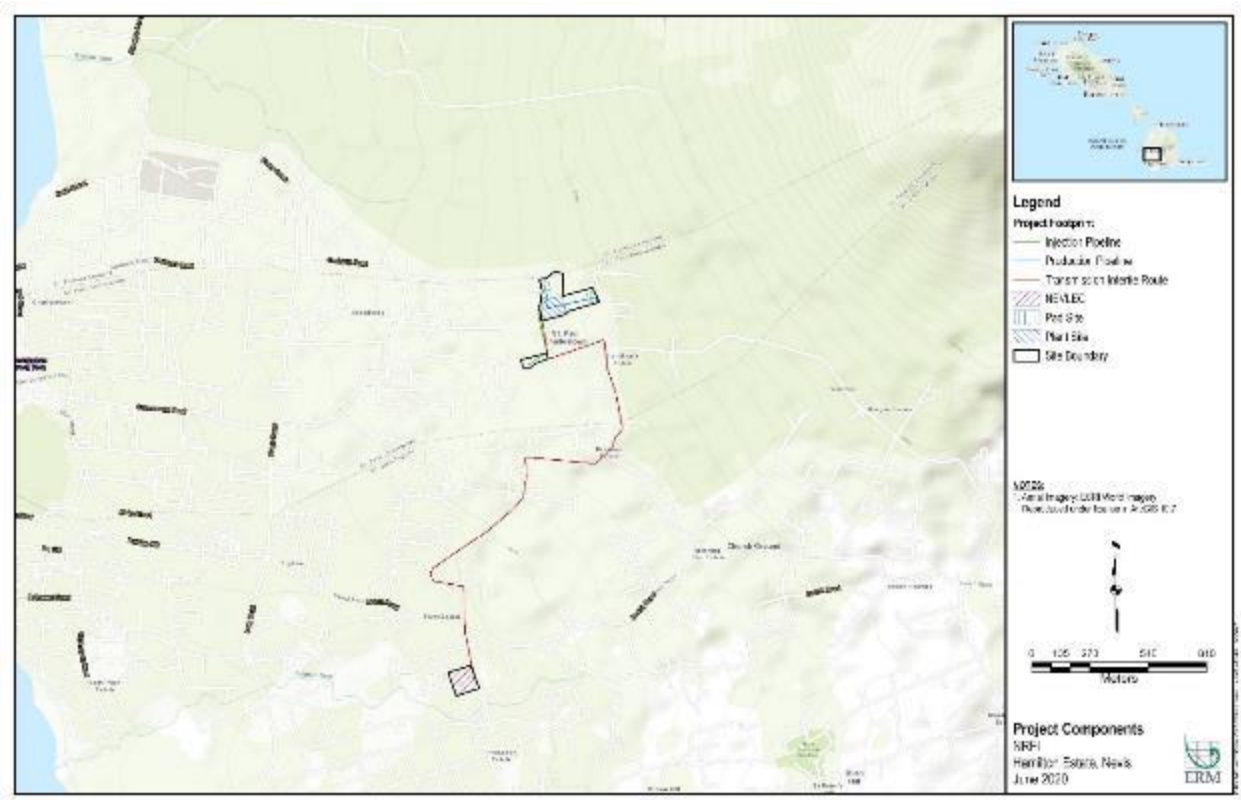
Nevis is largely dependent on imported fossil fuels to meet its electricity demand, resulting in relatively high per capita greenhouse gas emissions and a large portion of the domestic gross domestic product spent on purchasing energy. Successful implementation of the Nevis Geothermal Development Project would increase the proportion of clean renewable energy in the national energy mix; lower and stabilize energy prices; reduce reliance on imported fossil fuels; reduce carbon emissions; increase energy independence; and promote economic development.

1.2 Project Description

The proposed Project will be located on the island of Nevis, the southeastern island of the Federation of St. Kitts and Nevis. The Project is divided into two stages: the exploration phase, which is a Category B project, and the exploitation phase, which is a Category A project. Exploration activities involve drilling deep wells in the Earth's crust to characterize the thermal heat resource contained in underground reservoirs of geothermal water or steam. The wells are drilled in clusters within drill pads or platforms. Exploratory drill wells bring to the surface a mixture of steam, gas, and water, known as brine. Drilling wells are allowed to let brine out (i.e., blow testing) to confirm the well production capacity. Injection wells return the brine and other geothermal fluids from the exploratory wells back underground. The development plan relies on two deviated production and two injection wells. Both types of wells will be installed to a total vertical depth of 4,000 ft below surface. The two production wells will be located on the main Hamilton Estates property while the injectors will be completed downslope from the plant, at the 1.2-acre Hamilton Stable parcel.

Once exploration is done, the facility will be constructed as part of the exploitation phase. The facility itself will be located at the Hamilton Estates location, on the southwestern part of the Island, on a 9.1-acre area

with 6 additional adjoining acres in 2 parcels that may be added to the site for buffer purposes (see Figure below). Two of the test wells, designated N-3 and N-4, are on this site.



Source: ERM 2020

Figure ES-1-2. Project Component Location

The Figure below presents the location of the main Project components, which include the exploratory drill pads, a water system (including a water intake, water supply pipeline, and a water storage pond), and injection well pads (one for each site).

Figure ES-1-3. Plant Layout

The components and activities are described below:

- **Transportation** - Project equipment and materials will be brought into Long Point Port.
- **Site Preparation** – Each well pad will occupy a surface of approximately 50 m by 100 m, including two cellars per pad. Other required facilities include a water system (i.e., water sumps with a design volume of 5,000 m3). Excavated material will be reused or disposed offsite. Site preparation has been completed.
- **Drilling** – Each drill pad will contain a drill rig; large pipe rack, mud shaker; two 500-barrel water tanks; a generator; air compressor; mud pumps; fuel tanks; an office trailer; and reserve pit. Drilling will require up to 18 workers, and additional supervisors, with an effort for workers to be locally hired.
- **Plant Construction** – The construction process will begin by obtaining all the necessary permits, performing site surveys and equipment engineering (designs and layouts), followed by the site civil works (camp site layout and foundations, building constructions), then the electrical engineering and the procurement and packing and shipment of all equipment, erection of all mechanical and electrical works, and finally commissioning and plant handover. Construction will require up to 75 workers, with an effort for workers to be locally hired where possible.

The Table below presents a summary of the estimated timeline to conduct Project activities.

Table ES-1-1: Schedule by Activity

Activity	Estimated Time
Land transportation	Continuous throughout Project
Drill site preparation	Completed
Drill rig installation and drilling	45 days
Plant Construction	73 weeks
Transmission Line construction	6 weeks

1.3 Key Project Impacts and Mitigation Measures

- **Stakeholder Engagement** (Exploration and Exploitation) – Knowledge of the Project varies among Project-Affected Communities; some are very familiar with the Project, but others appear to know little. As part of the Supplementary ESIA, a robust Stakeholder Engagement Plan (SEP) has been developed, which needs to be made publically available and, most importantly, implemented. that the SEP establishes that NREI will hire a local Community Relations Officer (CRO) to help keep the community informed about the Project and help address community concerns through implementation of the Project's Grievance Management. Implementation of these measures should adequately manage this potential risk.
- **Noise** (Exploration and Exploitation) – the January 2020 Addendum to the 2017 EIA by Point Impact Analysis suggests that well drilling activities could result noise levels of up to 73 A-weighted decibels (dBA) at nearby residential receptors, which would exceed the IFC's daytime noise guidelines of 55 dBA equivalent sound level (Leq) and the nighttime noise guidelines of 45 dBA Leq if not mitigated. Well drilling and testing activities would last for more than 80 days for the eastern well pad, closest to two of the noise receptors, and an additional 40 days for maximum impacts from drilling of the injection well, which would have the greatest impact on three noise receptors. NREI has committed to installing an earthen berm or other temporary sound barrier to reduce drilling noise; however, the potential exists

that IFC daytime and nighttime noise guidelines would be temporarily exceeding during the drilling activities even with the additional noise mitigation measures.

- **Terrestrial Biodiversity** (Exploration and Exploitation) – The Project has a small footprint and would only directly impact a small area. The Project would also not directly impact any protected areas, but will temporarily degrade habitat quality as a result of noise, light, and increased human activity. There will be two near threatened herpetofauna species in the area, one endangered bird species and one vulnerable bird species. The ESMP includes a Biodiversity Management Plan. Implementation of these measures should adequately manage these risks.
- **Waste Management** (Exploration and Exploitation) **–** The Project would generate drill muds, drill cuttings, domestic wastewater, and small quantities of other miscellaneous solid wastes. Neither the drill muds nor cuttings are hazardous. The drilling contractor is contractually obligated to dispose of all drilling related waste material offsite at the local landfill. Onsite disposal of any waste material is prohibited. Hazardous waste material is not allowed to be disposed of at the local landfill. Any characteristic or listed hazardous waste produced by the drilling contractor will be containerized and shipped back to their headquarters in Trinidad for appropriate handling and disposal. The Project has a Waste Management Plan which includes mitigation measures. Implementation of these measures should adequately manage these risks.
- **Worker Code of Conduct and Grievance Mechanism** (Exploration and Exploitation) – The Project would require up to 120 total workers, with an effort to hire locally wherever possible. These workers would most likely be housed in nearby communities and would be working at the Project site for several months. There is always the potential for conflict between foreign workers and local communities (e.g., prostitution, drugs, and spread of diseases such as HIV/AIDS). ERM recommends that NREI develop a Worker Code of Conduct to help manage these potential conflicts, with penalties (ultimately leading to termination of employment) for worker non-compliance. In addition, NREI should implement the Grievance Mechanism that provides a process to review and address any community complaints (e.g., worker conduct, noise, traffic). Implementation of these measures should adequately manage these risks.
- **Recreation and Tourism** (Exploration and Exploitation) – The Project is located close to Nevis Peak trails and Hamilton Estate. The Project may affect these recreational users by increasing noise levels and changing the visual landscape as they pass the plant. These impacts are considered minor as the noise and visual effects are quickly reduced to negligible levels as hikers ascend the volcano. In fact, a geothermal power development with appropriate information signage could function as a complementary attraction for tourists to the volcano.
- **Cultural Heritage** (Exploration and Exploitation) – The Project has limited potential to affect the Hamilton Estate. There is also the limited potential that unanticipated discoveries may occur during construction. A Chance Finds Plan has been included as part of the Project's ESMP. Implementation of this plan should adequately manage these risks.
- **Surface Water and Groundwater** (Exploration and Exploitation) – The Project will need water for drill site preparation, drill rig installation, drilling, injection of geothermal fluids, consumption and disposal of geothermal fluids and to store hazardous materials. The potential impacts are alteration of drainage patterns, potential degradation of surface and groundwater quality and water consumption during drilling. To mitigate these impacts, the Project will implement a Soil Erosion and Sediment Control and Drainage Plan; will store all fuels, lubricants, and other hazardous materials used in construction equipment in appropriate storage tanks; will develop an SPCC Plan and will use a 350,000-gallon brine containment pond.

It is also important to make mention of the Project's plant safety systems, the assessment of natural hazards, the assessment of community health and safety, visual impacts and stakeholder consultation and disclosure efforts.

The Project's safety systems manage fire protection, pressure relief equipment, detectors and hurricane protection. Specifically, the fire protection system would consist of a fresh-water tank, an electric firewater supply pump and a jockey pump, fire mains, and local hose and spray stations; the Organic Rankin Cycle is protected by pressure relief equipment such as pressure relief valves and rupture disks; working fluid (n-pentane) detectors would be strategically placed around the binary plant facilities; and the Plant will implement wind protection screens around the air-cooled condenser units to protect them from wind and air-borne debris during hurricanes.

With regard to natural hazards, due to its geographic location, Nevis is exposed to meteorological and geophysical threats such as hurricanes and tropical storms, coastal flooding, volcanic eruptions, and earthquakes. As a result, careful attention in the design of Project components will be taken to ensure the Project is resilient to these natural disasters. As part of, and in addition to, risk prevention measures, there will be plans in place to assure emergency preparedness and response. With mitigation measures in place, impacts are expected to be minor.

In terms of community health and safety, Project-related impacts may stem from noise, emergencies, dust-related nuisance, and increased traffic. However, after the mitigation measures such as the noise mitigation measures described above or the development of a Community Emergency Response Plan, these impacts are expected to be minor in significance.

With regard to visual impacts, Project construction and operation could introduce new visual elements to the largely natural-appearing Project site. By employing mitigation measures such as minimizing vegetative clearing, minimizing nighttime construction or operation activities, and others, the Project will have minor impacts on aesthetics.

Lastly, it is important to mention the stakeholder consultation and disclosure efforts that the Project has undertaken as part of the supplementary ESIA. Multiple stakeholders were contacted, covering a range of organizations, such as government bodies like the Nevis Tourism Authority, the Nevis Island Authority, the Nevis Solid Waste Management Authority; community and civic society organizations such as the Nevis Historical and Conservation Society, the St. John's Improvement Club and spiritual leaders; as well as private citizens residing or owning land near the Project. Further, as part of the stakeholder consultation and disclosure efforts, the Project will host a Public Project Update Meeting, likely to take place in fall of 2020.

1.4 Conclusions

ERM concludes that the proposed Geothermal Project would result in environmental and social impacts, but these impacts could be readily mitigated and managed. The Project should comply with the requirements of the IDB Environment and Social (E&S) operating policies; and IFC PSs as long as the measures included in the Environmental and Social Management Plans (ESMP) are implemented.

2. INTRODUCTION

Nevis Renewable Energy International, Inc., (NREI) a subsidiary of Thermal Energy Partners, LLC is developing a 10-megawatt (MW) binary geothermal power plant and related facilities on the Island of Nevis, The Federation of St. Kitts and Nevis, West Indies. The organization of this Environmental and Social Impact Assessment (ESIA) corresponds to the two differentiated stages of the proposed project: exploration and power plant construction and operation ("exploitation"), classified as category B and A respectively.

The project financiers (IDB and CDB) agreed on this classification, based on an analysis of the likely E&S impacts and risks, which for the exploration drilling stage are considered to be mostly local and short-term. The first stage (exploration) has been classified as Category B+ (in accordance with the E&S impact categorization established in the Operating Manual of the Financiers broader Sustainable Energy Facility for the Eastern Caribbean). There is a considerable level of uncertainty in the resulting power production capacity of the well and consequently, on the final power capacity size of the resulting power plant. The second stage, the construction of the Power Plant, has been tentatively classified as Category A based on the current design, currently available information, and likely E&S impacts and risks.

Although from a financial point of view the potential lenders are only considering the exploration phases at this stage, a comprehensive description of impacts through all phases have therefore been included in order to present a full picture of the Project's impacts in the foreseeable future.

The Project is located in the Hamilton Estate on the island of Nevis, particularly on Hamilton Heritage Trust land that Nevis Island Authority (NIA) has leased to the company, with buildings on the Hamilton Stable parcel. Nevis is part of the inner arc of the Leeward Islands chain of the West Indies in the Caribbean Sea. The proposed Project would use local geothermal resources to provide a sustainable source of power that would reduce reliance on the world petroleum markets for electric power on Nevis and would decrease emissions of criteria pollutants and greenhouse gases (GHGs) associated with global climate change.

Point Impact Analysis (PIA) conducted an assessment of the environmental and social impacts of the project in 2010 and again during 2016-2017 and provided its Environmental Impact Assessment (EIA) of the Nevis Binary Geothermal Development Project (the Project) on May 2, 2017, which was issued for public comment on May 15, 2017. In January 2020, Point Impact Analysis provided an update as an addendum to the EIA.

Now, Environmental Resources Management (ERM) has supported NREI in the preparation of this First Supplemental Environmental and Social Impact Assessment (ESIA) to meet Inter-American Development Bank (IDB) and Caribbean Development Bank (CDB) requirements and address International Finance Corporation (IFC) standards for a Category B Project for the exploration phase. The Project is being considered to be partially financed by the IDB and the CDB. This First Supplemental ESIA should be read in conjunction with the previous EIA document. All documents will be made public on NREI, IDB and CDB webpages.

2.1 Project Proponents

In November 2013, NREI, a consortium of three of the leading geothermal energy developers in the industry, was selected through an open competitive process assisted by the US Department of State and their consultant, Deloitte Consulting Services, to develop 10MWs of geothermal energy for Nevis. On July 1, 2014 a concession agreement was signed. In February 2016, the Purchase Power Agreement was completed and released to NREI, and in March 2016, NREI selected Orion Drilling and HGI for well construction, Clemessy-Turboden as EPC contractor and the preliminary design and costings began.

NREI is an affiliate of the Texas-based Thermal Energy Partners, LLC (TEP). The Project will be carried out in collaboration with the Nevis Island Authority (NIA) and Nevis Electric Utility (NEVLEC). NREI will sell geothermal energy to NEVLEC, who will distribute it to residents. After a twenty-five year period, the plant will be turned over to NIA.

2.2 Purpose and Need for the Project

The proposed geothermal development Project would provide baseload renewable electricity to the island of Nevis and reduce the reliance on diesel fuel for power generation.

2.3 Objectives and Scope

The objective of this Preliminary Supplemental ESIA is to complement the studies prepared in the past and further assess the Project's environmental and social impacts according to the IDB's E&S Operating Policies, in conjunction with the IFC Performance Standards on Environmental and Social Sustainability (2012) and applicable IFC Environmental, Health, and Safety (EHS) Guidelines.

Specific objectives of this First Supplemental ESIA include:

- Update the Project Description and site alternative selection analysis;
- Identification of positive and/or negative changes in the human and natural environment that may affect the quality of life as well as current and future options for sustainable social and economic development in the Project's Area of Influence (AoI);
- Identification of measures to minimize negative impacts and enhance positive impacts of the Project, following the mitigation hierarchy; and
- Analysis of alternatives and recommendations for the best course of action inclusive of any relevant prevention or mitigation measures.
- Stakeholder mapping and documentation of existing consultations and or additional consultations and outreach activities;
- Present Environmental and Social Management Plans for the Project.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter summarizes the relevant policy as well as the legal and administrative framework of St. Kitts and Nevis applicable to the Project and the ESIA process. Both the EIA presented in December 2010 and the Final EIA in May 2017 for the Project included a Policy, Legal and Administrative Framework. The list of identified national legislation from the previous EIA documents has been used and enhanced for this report. The national institutions have also been added.

St. Kitts-Nevis is a Federal State but there are laws that apply to both islands, and in some cases there are island-specific ordinances. The same applies for institutions, some are common to both islands but Nevis has its own for some areas of governance.

The Project will be partially financed under the IDB and the CDB; therefore, it requires alignment with international standards including the IDB requirements, the CDB procedures, IFC PS and EHS Guidelines related to geothermal developments.

3.1 National Legal and Administrative Framework

St. Kitts and Nevis has adopted national environmental laws to protect forests, wildlife, biodiversity, water resources, agriculture and public health. The sections below present relevant national legislation and national institutions.

3.1.1 National Legislation

The Table below summarizes the most relevant national legislation.

Table 3-1. National Legislation

National Legislation	Summary
Development Control and Planning Act, 2000	The act established a Board to regulate and monitor the construction industry and ensure that all construction complies with the Building Code St. Kitts and Nevis upgraded the Building Code and increased inspections (Federation of St. Kitts and Nevis, 2005; St. Kitts and Nevis - Government, 2007).
Fisheries Act	The act provides for the licensing of fishing vessels, power to enter into agreements on fisheries access, and an institutional framework for the management, planning, development, and conservation of fisheries resources (UNEP, 2007).
Forestry Ordinance, 1904	The ordinance protects soil and water resources, and it designates all lands above the 1,000 ft. contour as forestry reserves to prevent further deforestation from the sugarcane industry (Collier, 2009).
Forestry Regulations	The NIA grants permits relating to forestry development, particularly for charcoal burning, fire control, and land clearing (IUCN, 1992).
Fruit Trees (Destruction Prohibition) Act	The act gives authority to the Director of Agriculture to enter and inspect land used to grow fruit trees. Destruction of fruit trees requires a license from the Director of Agriculture (Government of St. Kitts and Nevis, 2004).

National Legislation	Summary
National Conservation and Environmental Protection Act (NCEPA) of 1987	The act aims to establish protected areas such as national parks, nature reserves, botanical gardens, marine reserves, historic sites, scenic sites, and areas of special concern (Government of St. Kitts and Nevis, 2004). The act protects the preservation of biological diversity of wild fauna and flora species that may be endemic, threatened, or of special concern, designating approximately 90 species for further protection (Collier, 2009).
	The Act was amended by Act No.12 of 1996 to establish a Department of Environment (DOE) and make provision for the administration of the Act by the DOE. Under the Act, various activities that can degrade the environment are prohibited or controlled. These activities include the cultivation, clearance or burning of certain lands and the grazing of livestock.
Nevis Land Development Ordinance	The ordinance created a Nevis Land Development Corporation to organize the development division of land for agriculture, industry, and tourism. It established a fund for development on Nevis (Government of St. Kitts and Nevis, 2004). The Land Development Act 1991, which provides for the registration of agricultural lands and for the security of tenure for tenant farmers on such land. The Act provides for agricultural lands to be leased for periods of 35 years under registered leases and protects lessees from eviction by the landlord provided that the land is developed and used in accordance with the lease. The lessee is permitted to mortgage or charge the leasehold land as security for a loan from a bank prescribed under the Act.
Freehold Purchase Act 1996	The St. Kitts and Nevis Village Freehold Purchase Act 1996 is a legislation for the freehold enfranchisement of land tenants. The Act confers upon the tenants of land in prescribed areas, the option to purchase the land on which they have been residing for a specified period at a special price. The tenant may exercise this option by serving notice on the landlord, and in the case of St. Kitts and Nevis, the Minister is responsible for lands.
Agricultural Development Act, 1973	This act made provision for the more efficient use and economic development of agricultural lands, to promote the development of income and employment opportunities and improve the standards of living for farmers and workers in agriculture. The Act established the Agricultural Land Development Authority.
Physical Planning and Development Control Ordinance, 2005	Nevis Physical Planning and Development Control Ordinance, No.1 of 2005, was enacted. The Nevis Island Ordinance makes full provisions for the preparation of land use plans, including express provisions for ensuring that land use planning is part of an integrated development planning process.
Pesticides and Toxic Chemicals Control Act, 1999	The act set up regulation and control of the importation, storage, manufacture, sale, transportation, disposal, and use of pesticides and toxic chemicals. The act established a Pesticides and Toxic Chemicals Control Board.
Public Health Act, 1969	The act ensures the maintenance and safety of public health. The act created a Central Board of Health that is delegated the responsibility of preparing, execution, and coordination of actions beneficial to public health (UNEP, 2007). The ministry of health

National Legislation	Summary
	implements the act through two programs, the Institution Based Health Services and the Community Based Health Services. Hygiene and sanitation issues are addressed by the Environmental Health Department (WHO, 2008).
Solid Waste Management Act, 2009	This act regulates the management of waste and pollution prevention. It gives the Solid Waste Management Corporation responsibility to inventory and characterize solid waste generated and prepare a National Waste Management Strategy. The Corporation designates a list of activities for which an environmental impact assessment (EIA) is required. The Act provides rules governing storage, handling, importation, dumping, enforcement, and monitoring of waste (St. Kitts and Nevis, 2009).
Watercourses and Waterworks Act and Ordinance	This Act establishes a Water Board that is responsible for the control, management, maintenance and supervision of all watercourses and waterworks in St. Kitts and Nevis. The Act provides for the declaration of specific areas as watersheds, within which certain activities may be regulated. The act also prohibits some activities, including cultivation and grazing, within a given distance from watercourses (Federation of St. Kitts and Nevis, 2004). The ordinance established the Water Board to control, manage, supervise, and maintain watercourses and waterworks (Laws of St. Christopher, 1956).
Wild Bird Protection Ordinance	The ordinance prohibits the hunting of 18 species of birds. The ordinance established a hunting season for nine bird species (Collier, 2009).
Natural Disaster Management Act	The National Disaster Management Act (Chapter 19.06) seeks to establish an effective framework for the management and control of disaster. Part II of the Act establishes the National Disaster Management Agency.

Other acts and ordinances:

- Plant Protection Ordinance, 1913.
- Protection of Animals Act, 1935.
- Turtle Ordinance, 1947.
- Pesticides Act, 1973.
- Litter Act, 1983.
- St. Kitts-Nevis Building Regulations, Code and Guidelines, 2000.

3.1.1.1 Cultural Heritage Regulatory Context

The objective of the National Conservation and Environment Protection Act of 1987 is to “provide for the better management and development of the natural and historic resources of Saint Christopher and Nevis for purposes of conservation; the establishment of national parks, historic and archaeological sites and other protected areas of natural or cultural importance including the Brimstone Hill Fortress National Park; the establishment of a Conservation Commission; and for other matters connected thereto.” The act defines a historic site as “a place or site which is historic by reason of an association with the past and is part of the cultural and historical heritage of Saint Christopher and Nevis, and such a classification may include archaeological sites, historic landmarks, and areas of special historic or cultural interest.” Part II, Section 3

of the act allows the Minister (defined as "the Minister for the time being charged with the subject of Development"), in consultation with the Conservation Commission, to designate Protected Areas, including historic sites. Part III, Section 8 states that the Conservation Commission shall include the "President or his representative of the Nevis Historical and Conservation Society." Section 9 states that Protected Areas are to be held in trust by the Conservation Commission. Part IV establishes the Brimstone Hill Fortress as a National Park, and Part V recognizes Bath Hotel as a historic site. Part IX (Antiquities and Historic Buildings), Section 48 states that the excavation of archaeological sites must be done under a permit issued by the Minister, and Section 50 states that the Minister must be notified in the event of the inadvertent discovery of archaeological remains.

3.1.2 National Institutions

Relevant St. Kitts and Nevis' institutions are described below.

- *Department of Physical Planning and Environment (DPPE)*

  The DPPE of the Ministry of Sustainable Development is the government body acting as the focal point for the climate change communications. Its mission statement is to provide a framework to support the implementation of policies, programs and measures to control and regulate the development of land and buildings as well as to prevent, mitigate and/or reverse environmental degradation through scientific and technological excellence, raising public awareness, standard setting, advocacy and resource mobilization, thereby contributing to poverty reduction. The Department seeks to achieve its mission by providing for the stewardship of the country's environmental resources. It also seeks to protect public health through proper planning and development control measures and in a large way.

- *Department of Physical Planning, National Resources and the Environment (DPPNRE)*

  The DPPNRE is responsible for environmental management in Nevis as well as development control and forward planning. The DPPNRE implements Forward Planning through the preparation of physical planning instruments and studies in the interest of promoting the sustainable use of land, to include environmental research, land use and zoning plans, physical development standards and guidelines. It implements development control to provide guidance and development activities and methodology by ensuring their consistency and conformity with development regulation as well as approved planning standards and guidelines. In addition, it coordinates the spatial planning function in government and devise strategies for implementing and integrated spatial planning system; promotes policies, strategies and programs to enhance the protection, conservation and the sustained development and management of the island's natural and environmental resources, including the monitoring of environmental quality, conservation and preservation of critical environmental areas. It also, provides a platform for which Geographic Information can be shared between government agencies, NGO's and the public.

- *Department Land and Surveys (DOLS)*

  DOLS is responsible for the design, survey and implementation of residential land subdivision schemes. The general strategic objective of the DOLS is to establish a fixed boundary coordinated cadastral system after a systematic resurvey, cadastral plans, topographical maps, and the complete development of a Land Information System that would fully support the survey, registration, valuation and management of land. With representation on the Development Control and Planning Board, the Department of Lands and Surveys works closely with key public sector institutions to rationalize land use and land development decisions.

- *Department of Economic Planning and Public Sector Investment Planning (DEPPSIP)*

The DEPPSIP functions as the lead coordinating unit for local, regional, and international projects. The department operates as the country contact for lending and donor agencies such as the Caribbean Development Bank (CDB); Organization of American States (OAS); United Nations Development Program (UNDP); United Nations Environment Program (UNEP); the Global Environmental Fund (GEF); World Bank; and the European Union (EU). It facilitates the coordination of requests for technical assistance, grant funding and loans between various government ministries and non-governmental institutions and external donor agencies. The Department prepares and manages the Government's Public Sector Investment Program (PSIP) through close collaboration with line ministries and statutory corporations.

- *Department of Agriculture (DOA)*

  Agricultural development policies and programs in St. Kitts-Nevis are developed and managed by the Department of Agriculture on St. Kitts and on Nevis. Traditionally, the Department of Agriculture (DOA) has focused on agricultural extension services, focusing primarily on methods of cultivation and overall crop production. Generally, the Department of Agriculture is responsible for a range of services related to agriculture and rural development in both St. Kitts and Nevis.

- *Water Services Department (WSD)*

  The WSD is responsible for the identification, upkeep and protection of water supply sources on St. Kitts. The Watercourses and Waterworks Ordinance (1956) makes provision for the declaration of watersheds to protect waterworks and water sources. Watershed management is critical to maintaining both surface and groundwater sources. However, the WSD does not regard itself as a watershed management institution. When needed, the WSD works in close collaboration with the DPPE.

- *Public Works Department (PWD)*

  The PWD oversees the design of new and maintenance of existing public infrastructure, including roads, drainage, bridges, and culverts. Furthermore, it is responsible for overseeing the design, construction and repair of public buildings. As a member of the DCPB, the PWD provides technical support to the land development and building application review processes.

- *National Housing Corporation (NHC)*

  The National Housing Corporation (NHC) is responsible for the supply of affordable shelter accommodation and related infrastructure. The NHC is vested lands by the Government of St. Kitts-Nevis. NHC is responsible for development of the lands in accordance with guidelines established by Department of Physical Planning, Natural Resources and the Environment.

- *Nevis Land and Housing Development Corporation*

  The Nevis Housing and Land Development Corporation on Nevis is responsible for the public supply of affordable shelter accommodation and related infrastructure. The NHLDC is vested lands by the NIA respectively. The Nevis Housing and Land Development Corporation is responsible for developing the said lands according to the guidelines established by the Department of Physical Planning, Natural Resources and the Environment.

- *Whitegate Development Corporation (WGDC)*

  The objectives of the Corporation are to: a. Attract new development that would take full advantage of the unique quality of the development area; b. Attract sufficient independent new investment and development; c. Create new job opportunities and businesses so as to enhance the physical, social and economic standard of the existing communities in the development area and the entire development area; d. Enhance the value of land and the quality of life of residents of the development area.

- *St. Christopher National Trust (SCNT)*

  The Saint Christopher National Trust (SCNT) is a non-governmental organization founded in 2009 with the goal of preserving the national heritage of St. Kitts. The Trust evolved from the Draft Final Report-Impact Assessment for the Water Sector in St. Kitts and Nevis Environmental Solutions Limited 102 St. Christopher Heritage Society which was incorporated as a private company in 1994. The SCNT currently manages the National Museum in the Old Treasury Building in Basseterre. The main objective of the SCNT is to promote the protection, conservation, interpretation and enhancement of the natural environment of St. Kitts, including its animals and plant life. Also, it is intended that the Trust will provide a forum for the exchange of ideas, information and knowledge.

- *Nevis Historical and Conservation Society (NHCS)*

  The Nevis Historical and Conservation Society (NHCS) was established in 1980 to conserve the natural, cultural, and historic resources of the island and adjacent marine areas. The Society is a non-profit organization managed by an Executive Board. Since its inception the NHCS has instituted projects and policies designed not only to preserve Nevis' unique history and environment, but also to make that heritage accessible and intelligible to locals and visitors. The Ministry of Sustainable Development provides a general institutional coordinating mechanism for sustainable development in St. Kitts-Nevis. However, there is need for greater inter-agency cooperation and collaboration at the national level to make the model more effective.

- *Ministry of Health*

  The Ministry of Health is the national entity charged with the responsibility for the organization and management of health services and for formulating health policy. The public sector provides both population and personal health services through its subsidiary divisions.

  The Public Health Department is responsible for monitoring and testing water quality. In response to pollution issues Environmental Health Unit monitors the state of pollution in St. Kitts-Nevis.

- *National Emergency Management Agency (NEMA)*

  The National Emergency Management Agency (NEMA) was established in 1995 and is responsible for the coordination of pre and post disaster management activities. NEMA seeks to coordinate and facilitate pre and post disaster management activities at the community and national levels, in order to minimize vulnerability and mitigate against the impact of disaster on life, property and the well-being of residents of St. Kitts and Nevis. NEMA operates under the National Disaster Management Act of St. Christopher and Nevis, which establishes the legal framework for disaster management and is guided by the National Disaster Plan. NEMA operates as the Secretariat for the St. Kitts-Nevis National Disaster Mitigation Council which was established in 1999. The Secretariat is chaired by the Deputy Prime Minister, Hon. Sam Condor, and is comprised of Permanent Secretaries, Heads of key response agencies and Non-Governmental Organizations. The Council provides general oversight and related policy guidance. NEMA is responsible for emergency shelters.

3.1.3 National Environmental Impact Assessment Process

In 1994, SKN's National Environmental Action Plan stated that the Government of SKN intended to build on its existing legal foundation to complete the legal and regulatory framework for environmental management through the promulgation of implementing regulations for existing legislation, the adoption of legislation requiring environmental impact assessments for all major public and private sector investment, and the revision of major laws such as the Public Health Act. In particular, tourism development has had to be closely managed as it involves development of the environmentally fragile areas of the southeast peninsula area of St. Kitts, and the relatively unspoiled beach areas of Nevis for hotel accommodations,

tourism facilities, infrastructure and activities. The Southeast Peninsula Board has established procedures for approval of economic development applications that include requirements for Environmental Impact Assessments. These procedures also provide for monitoring to enforce agreed environmental management plans.

FAO also states that Environmental Impact Assessments practice in OECS countries has been very uneven (Toppin-Allahar, C. 2001. A comparative analysis of environmental assessment law and planning practice in the Commonwealth Caribbean, Caribbean Law Review). St. Kitts and Nevis is the only OECS country with environmental framework legislation - the National Conservation and Environmental Protection Act, No.5 of 1987, which mentions EIAs; but this pioneering legislation requires EIAs only with respect to projects to be carried out in the coastal zone.

Further, according to UN-DESA's Third International Conference on Small Island Sates, there is a general lack of regulations that accompany legislations in SKN. Apart from the Guidelines for Mainstreaming Sustainable Land Management into National Development, developed as an output of the Sustainable Land Management Project (SLMP), there are no specific guidelines and/or regulations designed to address sustainable development.[1] Notwithstanding the above, the planning authorities in SKN have been using the St. Kitts-Nevis Building Regulations, Code and Guidelines to manage land development practices.[2] Additionally, the Department of Physical Planning and Environment (DPPE) on St. Kitts and the Department of Physical Planning Natural Resources and the Environment (DPPNRE) on Nevis, supported by the Development Control and Planning Act and the Nevis Development Control and Planning Ordinance respectively, have developed guidelines for the conduct of Environmental Impact Assessments (EIA).[3] These guidelines, laid out in St. Christopher and Nevis Development Control and Planning Act of 2002, state the following:

1. Unless the Board otherwise determines it, environmental impact assessments shall be required in respect of any application for development permission to which the Third Schedule applies.
2. The Board may require environmental impact assessment of any development, other than a development set out in the Third Schedule, where it is of the opinion that significant adverse environmental impact could result.
3. On receipt of an application for development permission, the Board shall determine whether environmental impact assessment of the proposal is required having regard to
    i. the nature of the development activity proposed;
    ii. the geographical extent, scale and location of the proposed development;
    iii. the extent and significance of the changes to the environment likely to be caused by the proposed development;
    iv. the extent of general knowledge about the nature of the proposed development and its likely impact on the environment;
    v. any development plan for the area;
    vi. any other matter as may be prescribed.

[1] UN-DESA Third International Conference on Small Island Sates, St. Kitts and Nevis, accessed at https://sustainabledevelopment.un.org/content/documents/1129245SKN%20Final%20Draft%20National%20Report.pdf

[2] UN-DESA Third International Conference on Small Island Sates, St. Kitts and Nevis, accessed at https://sustainabledevelopment.un.org/content/documents/1129245SKN%20Final%20Draft%20National%20Report.pdf

[3] UN-DESA Third International Conference on Small Island Sates, St. Kitts and Nevis, accessed at https://sustainabledevelopment.un.org/content/documents/1129245SKN%20Final%20Draft%20National%20Report.pdf

4. Where it determines that environmental impact assessment is required, the Board shall, within thirty days of the receipt of an application for development permission, issue a written notice notifying the applicant or the person responsible of the determination that environmental impact assessment is required of the development proposal and setting out the terms of reference for the preparation of an environmental impact statement on the development proposal and the period within which the environmental impact statement shall be submitted to the Board.
5. Where the Board issues a notice under subsection (4), the applicant, or as the case may be, the person responsible, shall submit to the Board an environmental impact statement on the development proposal in such form and containing such information as may be prescribed, and the applicant or, as the case may be, the person responsible, shall comply with this requirement.
6. In this section, "person responsible" includes any person at whose order or on whose behalf the development will be or is being undertaken.
7. The Minister may make Regulations prescribing the qualifications, skills, knowledge and experience which shall be possessed by persons preparing environmental impact statements and may cause a register of persons so qualified to be compiled and a person who is on such a register shall be deemed to be approved by the Minister to prepare environmental impact statements in respect of Saint Christopher.

The Third Schedule states that an EIA shall be required for: hotels of more than twelve rooms; sub-divisions of more than six plots; residential development of more than six units; any industrial plant which in the opinion of the Board is likely to cause significant adverse environmental impact; quarrying and other mining activities; marinas; land reclamation, dredging and filling of ponds; airports, ports and harbors; dams and reservoirs; hydro-electric projects and power plants; desalination plants; water purification plants; sanitary land fill operations, solid waste disposal sites, toxic waste disposal sites and other similar sites; gas pipeline installations; any development projects generating or potentially generating emissions, aqueous effluent, solid waste, noise/vibration or radioactive discharges; any development involving the storage and use of hazardous materials; coastal zone development and development in wetlands, marine parks, national parks, conservation areas, environmental protection area or other sensitive environmental areas.

3.2 International Conventions and Agreements

The following international conventions and agreements have been ratified by St. Kitts and Nevis:

- United Nations Framework Convention on Climate Change (UNFCCC);
- Kyoto Protocol;
- The Convention on Biological Diversity;
- International Plant Protection Convention (IPPC);
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971 (Ramsar Convention);
- Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean (SPAW Protocol) (The Cartagena Convention was drafted in 1983, with St. Kitts and Nevis signing in 1999);
- United Nations Convention to Combat Desertification in those Countries experiencing Serious Drought and/or Desertification, Particularly in Africa, Paris (1994) (St. Kitts and Nevis became a party to the Convention by accession on 30 June 1997);
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their disposal;

- Vienna Convention for the Protection of the Ozone Layer;
- Montreal Protocol on Substances that Deplete the Ozone Layer;
- Ramsar Convention on Wetlands; and
- [Non-binding international agreement] United Nations Conference on the Sustainable Development of Small Island Developing States, Bridgetown, (1994).

3.3 International Standards

3.3.1 Inter-American Development Bank (IDB)

The IDB has established its own policies and safeguards to ensure that projects financed by the IDB group are sustainable (see Table below). These environmental and social policies are guided by international best practices, and are relatively consistent with widely used International Finance Corporation (IFC) guidelines regarding environmental, health, and social management.

Table 3-2. IDB Safeguards and Policies

IDB Policies	Policy Description
OP-703 – Environmental and Safeguards Compliance Policy	The Policy has three specific objectives: (i) To enhance long-term development benefits by integrating environmental sustainability outcomes in all Bank operations and activities and strengthening environmental management capacities in its borrowing member countries (ii) To ensure that all Bank operations and activities are environmentally sustainable (iii) To foster corporate environmental responsibility within the Bank The Policy has two sets of directives, as follows: • *Environmental Mainstreaming (Directives A.1 through A.7),* which refer to the concept of mainstreaming environmental issues and upstreaming them early on during the project cycle. • *Safeguarding Directives (Directives B.1 through B.16)* – allow the Bank to adopt a more effective and efficient risk management framework. Safeguards are applied throughout the project cycle to ensure the environmental sustainability of all Bank-financed operations. The Environmental Safeguards Directives are: B.1 Bank Policies; B.2 Country Laws and Regulations; B.3 Screening and Classification; B.4 Other Risk Factors; B.5 Environmental Assessment Requirements; B.6 Consultations; B.7 Supervision and Compliance; B.8 Transboundary Impacts; B.9 Natural Habitats and Cultural Sites; B.10 Hazardous Materials; B.11 Pollution Prevention and Abatement; B.12 Project Under Construction; B.13 Noninvestment Lending and Flexible Lending Instruments; B.14 Multiple Phase and Repeat Loans; B.15 Co-financing Operations; B.16 In-country Systems; B.17 Procurement.
OP-761 Gender Equality in Development	This Policy integrates a gender perspective that seeks equal conditions and opportunities for women and men to reach their social, economic, political, and cultural potential by providing specific mechanisms for ensuring the effective implementation of the Policy and the evaluation of its results.
OP-704 – Natural and Unexpected Disasters Policy	The Policy has two interrelated specific objectives: i) To strengthen the Bank's effectiveness in supporting its borrowers to systematically manage risks related to natural hazards by identifying these risks, reducing vulnerability, and preventing and mitigating related disasters before they occur

IDB Policies	Policy Description
	ii) To facilitate rapid and appropriate assistance by the Bank to its borrowing member countries in response to disasters in an effort to efficiently revitalize their development efforts and avoid rebuilding vulnerability
OP-102 Access to Information Policy	This Policy is based on the principle that information concerning the Bank and its activities must be made available to the public in the absence of a compelling reason for confidentiality. Information provided to the public must be made available in a form and at a time that enhances the transparency and therefore the quality of Bank activities.

Source: IDB, Operational Policies.

Regarding environmental and social issues, the Project triggers the following directives of the Environment Safeguard Policy (OP-703):

- *B.1, Bank Policies*: The Bank will only finance operations and activities that comply with the directives of this policy and are consistent with the relevant provisions of other Bank policies. This policy ensured the borrower/executing agency has legislation in place that promotes environmental management, training, and environmental governance, and also promotes conservation and sustainable use of natural resources.
- *B.2, Country Laws and Regulations*: Project activities must comply with all St. Kitts and Nevis laws and regulations, including the preparation of an ESIA.
- *B.3, Screening and Classification*: The Project will have impacts on the environment and the community. The Project is classified as Category "A" for the exploitation phase and Category B for the exploration phase (currently considered). In accordance with OP-703, Category A projects are "any operation that is likely to cause significant negative environmental and associated social impacts, or have profound implications affecting natural resources," and require a project specific ESIA as well as an ESMP.
- *B.4, Other Risk Factors*: The Project's executing agency needs to comply with the ESIA and ESMP requirements. Therefore, the executing agency and relevant third parties will be required to develop appropriate measures for managing the identified risks, and such risks include economic displacement.
- *B.5, Environmental Assessment Requirements*: This Preliminary Supplemental ESIA addresses the IDB's requirement for environmental assessment for the Project.
- *B.6, Consultations*: An initial public consultation was conducted on 8 November 2017 to discuss possible alternatives and receive initial stakeholder feedback. Consistent with the IDB's Access to Information Policy (OP-102) and this policy (OP-703), this Preliminary Supplemental ESIA will be made available to the public and then an additional consultation with affected parties will be scheduled for August 2020.
- *B.7, Supervision and Compliance*: A monitoring plan will be implemented for the Project as part of the Project's ESMP.
- *B.9, Natural Habitats and Cultural Sites*: The Project is located near Charlestown, on the Island of Nevis and although there are no known prehistoric archaeological sites and no currently listed historic sites or landmarks in the Project area, there is a known, non-listed historic site in a neighboring property (see Section 5.4). This directive requires the development of mitigation and monitoring measures to mitigate the potential impacts identified in this ESIA and the ESMP.

- *B.10, Hazardous Materials:* The Project will require the use of hazardous materials and will result in the production of hazardous waste. Hazardous material minimization, handling, storage, transportation and disposal is addressed in the Project's ESMP (see Section 8).
- *B.11, Pollution Prevention and Abatement*: Project activities have a risk of pollution, specifically during the construction phase. Pollution prevention is addressed in the Project's ESMP (see Section 8).
- *B17. Contractor clause for implementation of ESMP*

Additionally, the Project triggers the IDB's Access to Information Policy (OP-102), the Gender Equality in Development Policy (OP-761), and the Disaster Risk Management Policy (OP-704). When it comes to financing projects, it is the Bank's intent to be as clear and transparent as possible and, through clear stakeholder communication, to improve the quality of its operations.

3.3.2 Caribbean Development Bank (CDB)

The Caribbean Development Bank (CDB) has the following policies and strategies:

- Procurement Policy for Projects Financed by CDB (November 1, 2019);
- Education and Training Policy and Strategy (October 2, 2017);
- Evaluation Policy (December, 2016);
- Lending Policies (December 1, 2016);
- Projects Complaints Mechanism Policy (May 1,2015);
- Compliance Policy (May 1, 2015);
- Whistleblower Policy (May 1, 2015);
- Integrity and Ethics Policy (May1, 2015);
- Strategic Framework for Integrity, Compliance and Accountability (May 1, 2015);
- Energy Sector Policy and Strategy (March 1, 2015);
- Environmental and Social Review Procedures (December 1, 2014);
- Procedures for Dealing with Fraud and Corruption in CDB-financed Projects (October 1, 2014);
- Technical Assistance Policy and Operational Strategy (September 1, 2012);
- Climate Resilience Strategy (July 1, 2012);
- Information Disclosure Policy (October 1, 2011);
- Disaster Management Strategy and Operational Guidelines (January 1, 2009);
- Gender Equality Policy and Operational Strategy (November 1, 2008);
- Education and Training Policy and Strategy (December 1, 2004);
- Private Sector Development Strategy (April 1, 2004);
- Urban Revitalization Strategy and Operational Guidelines (October 1, 2000).

One of the most relevant CDB policies for the purpose of this report and the Project itself is the Environmental and Social Review Procedures (ESRP) from December 1, 2014. The ESRP builds on the experience gained in the application of Caribbean Development Bank's (CDB) Environmental Review Guidelines (1994) and the Guidelines for the Social Analysis of Projects (2004) that to date have been the primary guidance document for assessing the environmental and social dimension of its operations. The

revised ESRP reflects recent shifts in thinking and approaches by the development community in addressing issues of environmental and social sustainability and poverty reduction. These include the need for enhanced dialogue, participation and consultations with all stakeholders and systematic assessment of impacts and risks. As well as more focus on the analysis of the social dimensions of development initiatives and greater effort to harmonize policies and procedural requirements with the wider development community to improve development effectiveness. In addition to providing support to Borrowing Member Countries (BMCs) to address issues they have identified as priority concerns, central to their efforts to reduce poverty and to achieve their sustainable development objectives.

The ESRP outlines how CDB within its mandate and operations ensure that environment and social risks are managed. The ESRP includes eight environment and social performance standards that reflect the principles, core policies, standards and best practice approaches adopted and used in the treatment of sensitive environmental and social issues by the multilateral financial and development community. The objectives of the performance requirements are to:

- Optimize decision making with respect to environment and social impacts, and risks to anticipate, avoid, mitigate, and/or compensate for adverse project impacts on the environment and affected people and communities;
- Assist BMCs to build capacity and strengthen their institutions and governance systems to effectively manage environmental and social risks; and
- Provide staff, BMCs and other development partners with a clear understanding of the CDB's requirements, and procedures, accountabilities for managing environment and social risks in its operations.

The environmental and social performance requirements include objectives, principles and scope related to:

a. Pollution Prevention, Control and Management;
b. Toxic and Hazardous Substances Control and Management;
c. Physical Cultural Property;
d. Natural Habitats and Biodiversity Conservation;
e. Directly Affected Communities;
f. Vulnerable Groups;
g. Land Acquisition and Resettlement;
h. Community, Worker Health and Safety.

CDB will not finance projects that do not meet its environment and social performance requirements as defined in the ESRP. Borrowers are required to monitor and report to the Bank on their compliance with the ESRP requirements. The Bank recognizes the value a well-informed and engaged public can bring to the development process and contribute to the attainment of the BMC's sustainable development objectives. CDB is therefore committed to the principle of corporate transparency, accountability and stakeholder engagement, and BMCs are encouraged to adopt and promote these principles.

The ESRP requires that Borrowers initiate early engagement, participation, consultations and disclosure of information to parties likely to be affected by significant negative impacts from the investments projects it finances (CDB, Environmental and Social Review Procedures, 2014).

3.3.3 Other Applicable International Best Practices: International Finance Corporation (IFC)

Although the Project is committed to complying with the IDB Safeguards and CDB policies and procedures, the IDB itself recognizes a series of additional norms and standards that, if implemented, could help minimize risks associated with the development of this Project. These are described below.

The IFC is a division of the World Bank Group that lends to private investors. The IFC released a Sustainability Policy and set of Performance Standards (PS) on Social and Environmental Sustainability in January 2012. These standards stipulate that the Project shall meet certain requirements throughout the life cycle of an investment by IFC or other relevant financial institution or commercial banks, which are signatory to the Equator Principles (EP 2006).

These PS and guidelines provide ways and means to identify impacts and affected stakeholders and lays down processes for management and mitigation of adverse impacts, see the table below.

Table 3-3. IFC Performance Standards

Performance Standard	Description	Purpose
PS 1: Assessment and Management of Environmental and Social Risks and Impacts	Underscores the importance of managing environmental and social performance throughout the life of a project (any business activity that is subject to assessment and management).	■ To identify and assess environmental and social risks and impacts of the project. ■ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize impacts and risks ■ To promote improved environmental and social performance through management systems. ■ To ensure grievances and external communications from are responded to and managed appropriately. ■ To promote and provide means for adequate engagement with Affected Communities
PS 2: Labour and Working Conditions	Recognises that the pursuit of economic growth through employment creation and income generation should come with the protection of worker's fundamental rights.	■ To promote the fair treatment, non-discrimination and equal opportunity of workers and to protect workers. ■ To promote compliance with national labour and employment laws. ■ To promote safe and healthy working conditions, and health of workers.
PS 3: Resource Efficiency and Pollution Prevention	Recognises that increased economic activity can generate increased levels of pollution and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.	■ To avoid or minimise adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. ■ To promote more sustainable use of resources, including energy and water. ■ To reduce project-related greenhouse gas emissions.
PS 4: Community Health, Safety and Security	Recognises that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.	■ To anticipate and avoid adverse impacts on health and safety of the Affected Community during the project life from both routine and non-routine circumstances ■ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

Performance Standard	Description	Purpose
PS 5: Land Acquisition and Involuntary Resettlement	Recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land.	■ To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. ■ To avoid forced eviction. ■ To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use ■ To improve or restore, the livelihoods and standards of living of displaced persons.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Recognises that protecting and conserving biodiversity, maintaining ecosystems services, and sustainably managing living and natural resources are fundamental to sustainable development	■ To protect and conserve biodiversity. ■ To maintain the benefits from ecosystem services. ■ To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.
PS 7: Indigenous Peoples	Recognises that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalised and vulnerable segments of the population.	■ To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples ■ To anticipate and avoid or minimize adverse impacts of projects on communities of Indigenous Peoples ■ To promote sustainable development benefits and opportunities for Indigenous Peoples ■ To establish and maintain an ongoing relationship based on Informed Consultation and Participation with the Indigenous Peoples affected by a project through the project's life cycle. ■ To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples
PS 8: Cultural Heritage	Recognises the importance of cultural heritage for current and future generations	■ To protect cultural heritage from the adverse impacts of project activities and support its preservation ■ To promote the equitable sharing of benefits from the use of cultural heritage.

Source: IFC Performance Standards, January 2012

IFC EHS Guidelines

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. This information supports actions aimed at avoiding, minimising, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility. The EHS Guidelines serve as a technical reference source to support the implementation of the IFC PSs, particularly in those aspects related to PS 3: Pollution Prevention and Abatement, as well as certain aspects of occupational and community health and safety. The IFC also has industry sector guidelines that can be used, especially, the Geothermal Power Generation guidelines for this Project. General EHS Guidelines (30 April 2007) also exist, which contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors.

When host country (St. Kitts and Nevis) regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is required.

4. PROJECT DESCRIPTION

Like many island nations, St. Kitts and Nevis is heavily reliant on fossil fuels for electricity generation, leaving it vulnerable to global oil price fluctuations that directly impact the cost of electricity. The government subsidizes the fuel charge for residential customers, partially shielding that sector from price volatility (NREL, 2015).

The Nevis Electricity Company Limited (NEVLEC) is the sole provider and distributor of electricity in Nevis (BV, 2014). The company, which opened its doors on September 1, 2000, is a fully owned subsidiary of the Nevis Island Administration (NEVLEC, 2020). NEVLEC owns a Diesel Power Plant at Prospect (the "Prospect Power Plant") which consist of 7 diesel engines, with a total installed name plate capacity of 13.9 MW, and an available maximum capacity of 12.9 MW. NEVLEC currently delivers approximately 55,112,474 kilowatt-hours (kWhr) per year to its customers, and expects this demand to increase by 3 percent annually (PIA, 2017).

In addition there is a wind farm with a name plate rating of 2.2 MW operated by Windwatt (Nevis) Ltd that has been in service since August 2010, the first in the Eastern-Caribbean, which provides limited amounts of electricity (IDB, 2013).

Electricity is distributed throughout the island via five (5) 11 kV feeders that originate from Prospect Power Plant (BV, 2014):

1. Charlestown Feeder #1
2. Charlestown Feeder #2
3. Cotton Ground Feeder
4. Gingerland Feeder
5. Four Seasons Feeder

The Island of Nevis has long been identified as a known geothermal resource. Site investigations over the last three decades have included both regional and site-specific studies. Direct investigations of the Island resources have included a broad range of geophysical surveys, geochemical testing of wells, hot springs and fumaroles and installation and testing of exploration wells across the Island, with data showing that the local geothermal resource is several times that required to meet the power needs of Nevis and export to neighboring islands (TEP, 2019).

The Federation of St. Kitts and Nevis has adopted a goal of supplying nearly 100 percent of its electricity from renewable resources (PIA, 2017). Thermal Energy Partners (TEP), through its subsidiary Nevis Renewable Energy International (NREI) and in partnership with the Nevis Island Administration (NIA) are developing a geothermal power plant (the proposed Project) to meet the full electric demand of the island with a non-combustion, renewable energy source with zero carbon dioxide emissions.

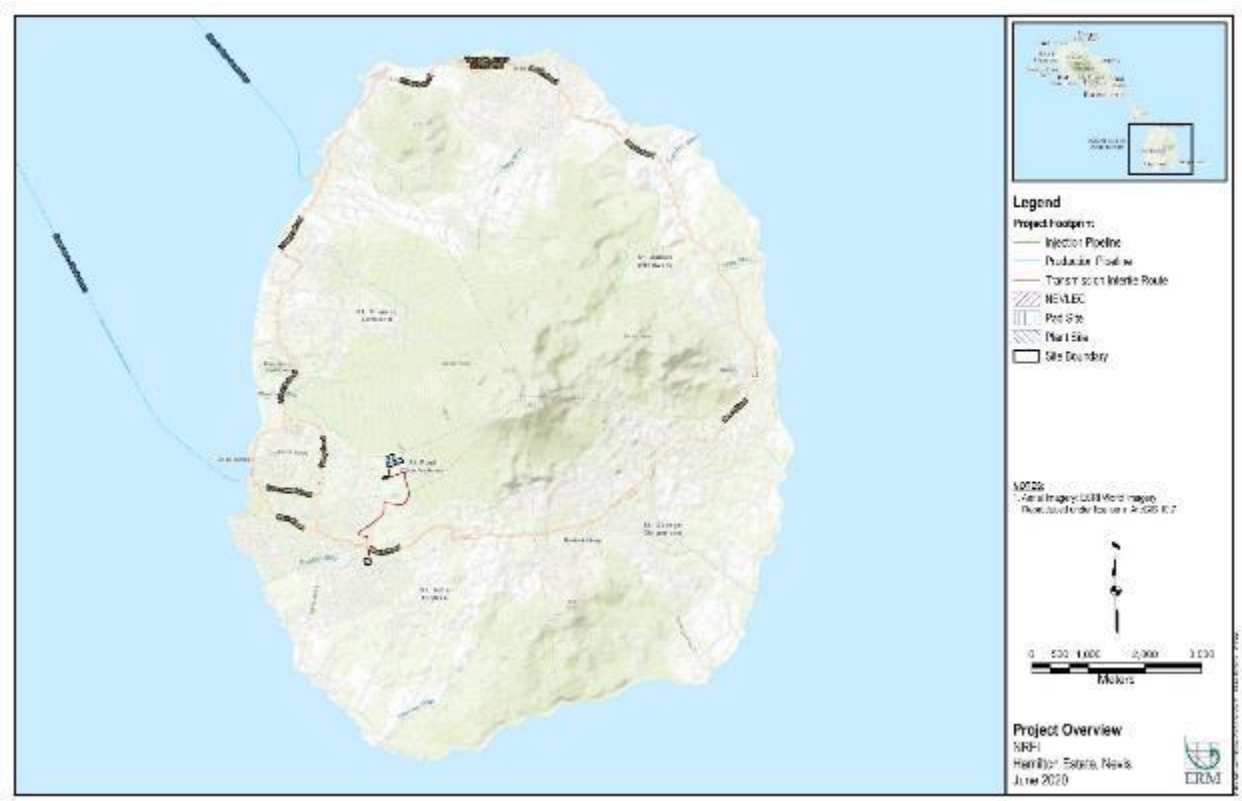
The proposed Project will help transition the Island away from its dependence on fossil fuels for power generation and toward its goal of 100 percent reliance on clean renewable geothermal energy, and make Nevis energy independent.

Based on the site investigations performed (see Alternatives Analysis, Section 4.6 below), the Hamilton Estate concession was selected as the site for the development of the geothermal plant.

4.1 Project Location

The proposed Project will be located on the island of Nevis, the southeastern island of the Federation of St. Kitts and Nevis. The Federation is part of the Windward Islands, in the Lesser Antilles, and sits northwest

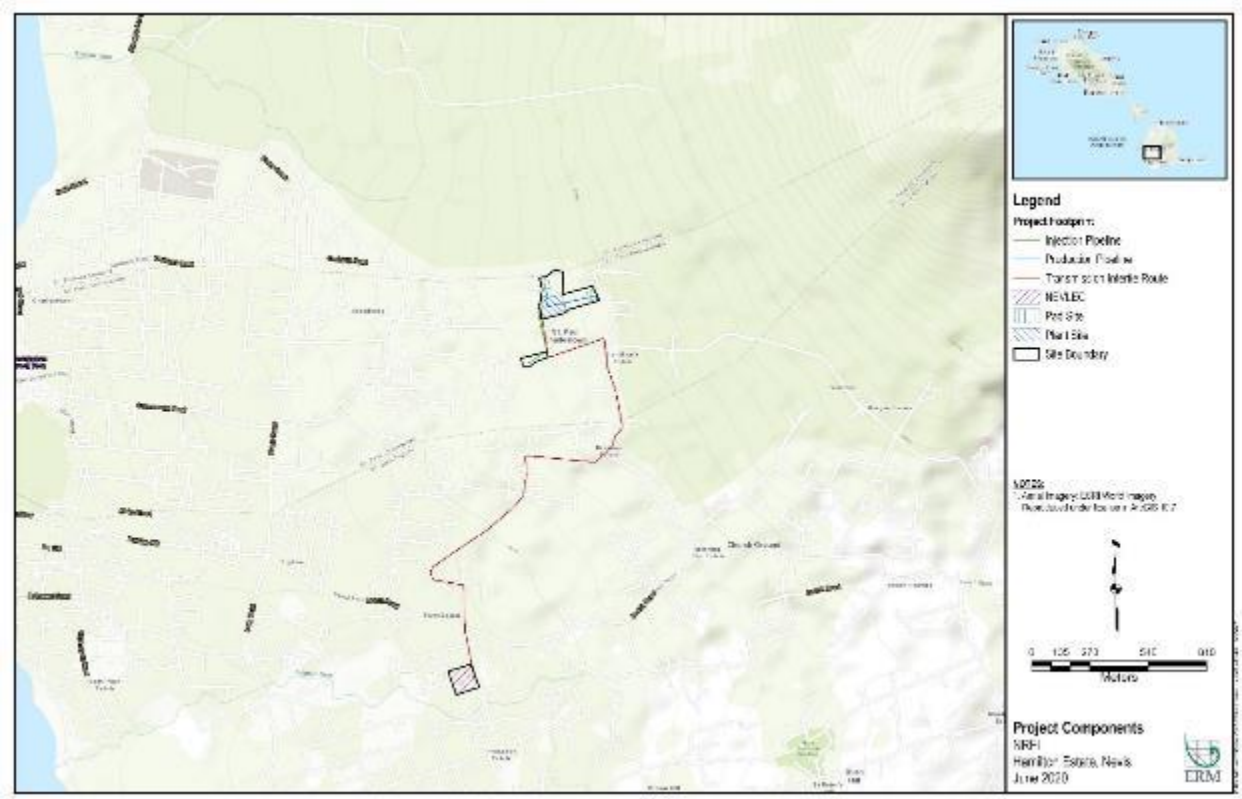
of Montserrat, west of Antigua, south of Sint Maarten and Saint Barthelemy, and southeast of Saba. Its western coast faces the Caribbean Sea, whereas the Atlantic Ocean opens to the east of the island (see Figure 4-1 Project Location below).



Source: ERM, 2020

Figure 4-1 Project Location

The facility itself will be located at the Hamilton Estates location, on the southwestern part of the Island, on a 9.1-acre area with 6 additional adjoining acres in 2 parcels that may be added to the site for buffer purposes (see Figure 4-2. Project Component Locations below). Two of the test wells, designated N-3 and N-4, are on this site.



Source: ERM 2020

Figure 4-2. Project Component Locations

4.2 Process Overview

The proposed Project will be a binary cycle geothermal power plant. A binary cycle power plant is a closed-loop system (with no emissions under normal operating conditions) where the heat from geothermal hot water is transferred to another liquid (in this case, the organic compound n-pentane) via a heat-exchanger and is then reinjected back into the reservoir via injection wells. The heat from the geothermal hot water causes this second liquid to turn to steam, which is used to drive a generator turbine (EERE, 2020). The second liquid is then re-condensed, and the cycle begins all over again as shown in the figure below.

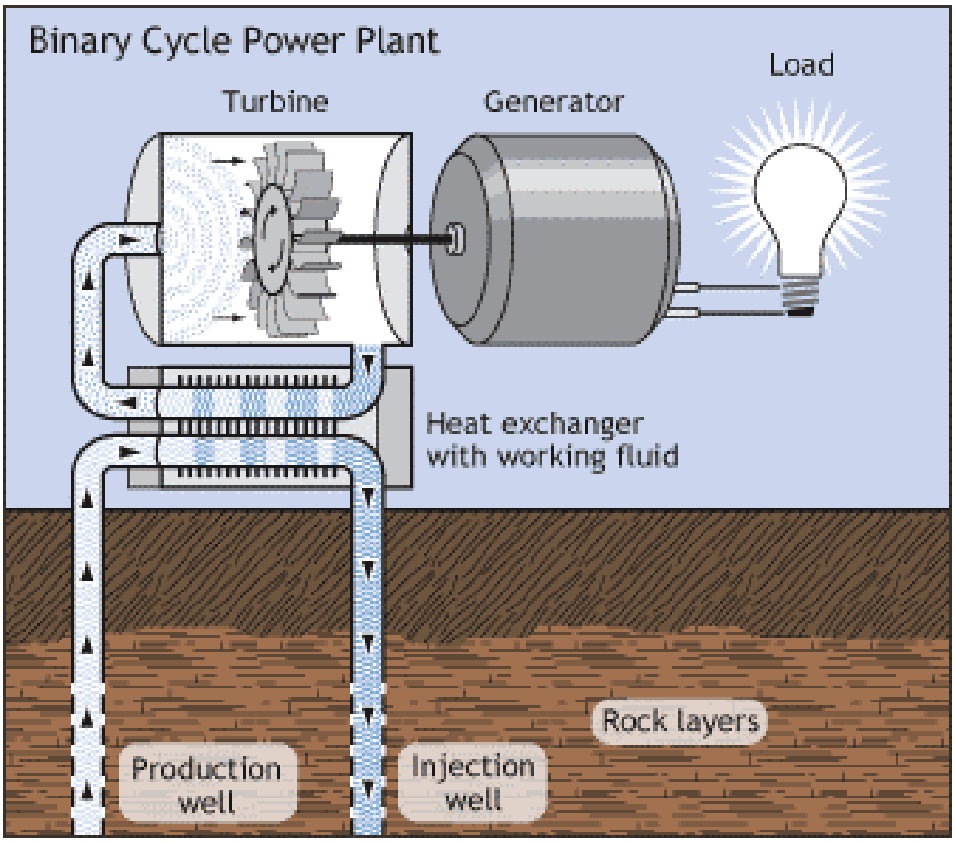


Figure Source: (EERE, 2020)

Figure 4-3. Typical Binary Cycle

For the Project plant, two Exergy radial outflow turbines and generators (2 x 5.389MWe Gross) will be installed and connected to the resource gathering system (production wells). The system will operate in two separately closed loops: one for the primary thermal fluid extracted from the reservoir and then reinjected back into the reservoir at a different location (the geothermal fluids), and the other for the Organic Rankin Cycle (ORC) fluid (in this case n-pentane) which is circulated from the heat exchangers, to the turbines, to the cooling and recondensing system, and then back to the heat exchangers.

The geothermal fluids drawn from the reservoir will flow through the heat exchangers in the Power Generation Units transferring heat through the heat exchanger to the ORC working fluid, causing it to flash to vapor, and spin the turbines. Once the geothermal fluid goes through the heat exchangers, it will be returned to the reservoir through the injection wells. After passing through the turbines, the ORC fluid in vapor form will be condensed back to liquid form via air cooling and cycled back into the heat exchanger (see Process Diagram below).

The plant design includes a retention (sump) pond capable of accommodating the free flow of a well in the event it is needed for maintenance or bypass issue.

While the Project Description describes both the exploration and exploitation stages, it is important to keep in mind that the current financing process as of the publication of this First Supplementary ESIA is for exploration only.

4.3 Project Components

The proposed Geothermal facility will consist of the following main components which are explained in more detail in the following sub-sections:

- Plant Equipment:
  - Production and Injection Wells
  - Turbine Generator
  - Vaporizer
  - Preheaters (liquid, gas)
  - Recuperator
  - Air Cooled Condensers (ACC)
  - Pumps (wells, ponds, feed, firefighting system)
  - Storage Tanks
  - Muffler
  - Separation Station
  - Oil Cooler
  - Lubricating Unit
  - Condensate Tanks
  - Non-Condensable Gas (NCG) Compressor
  - Firefighting system pumps and tank
- Facilities:
  - Administration and Control Building
  - Workshop and Warehouse
  - Firefighting System Pump Room
  - Compressor and Inhibitor Rooms
  - Security Building
  - Ponds
  - Septic Tank
  - Car Park
  - Road

Figure 4-4. Plant Layout

4.3.1 Production and Injection Wells

The Project 10MWe development plan relies on two deviated production and two injection wells. Both types of wells will be installed to a total vertical depth of 4,000 feet below surface, with a deviated angle beginning at approximately 1,000 feet below ground surface and not to exceed 30 degrees from the vertical. The two production wells will be located on the main Hamilton Estates property while the injectors will be completed downslope from the plant, at the 1.2-acre Hamilton Stable parcel. The injection pipeline would have a valve at the injection pad, so that the second injection well could be used if one well failed or could not handle the full injection flow from the plant (See Figure 4-4. Plant Layout above). This configuration provides a separation distance between the production and injection wells of approximately 3,000 feet.

4.3.1.1 Well Pads

NREI would need an area of less than one acre for each production and injection well pad. During drilling, the well pads would accommodate the drill rig, large pipe rack, mud shaker, two 500-barrel water tanks, a generator, air compressor, mud pumps, fuel tanks, an office trailer, and reserve pit to collect the bore cuttings and fluids during testing (see proposed layout areas in Figure 4-5 below).

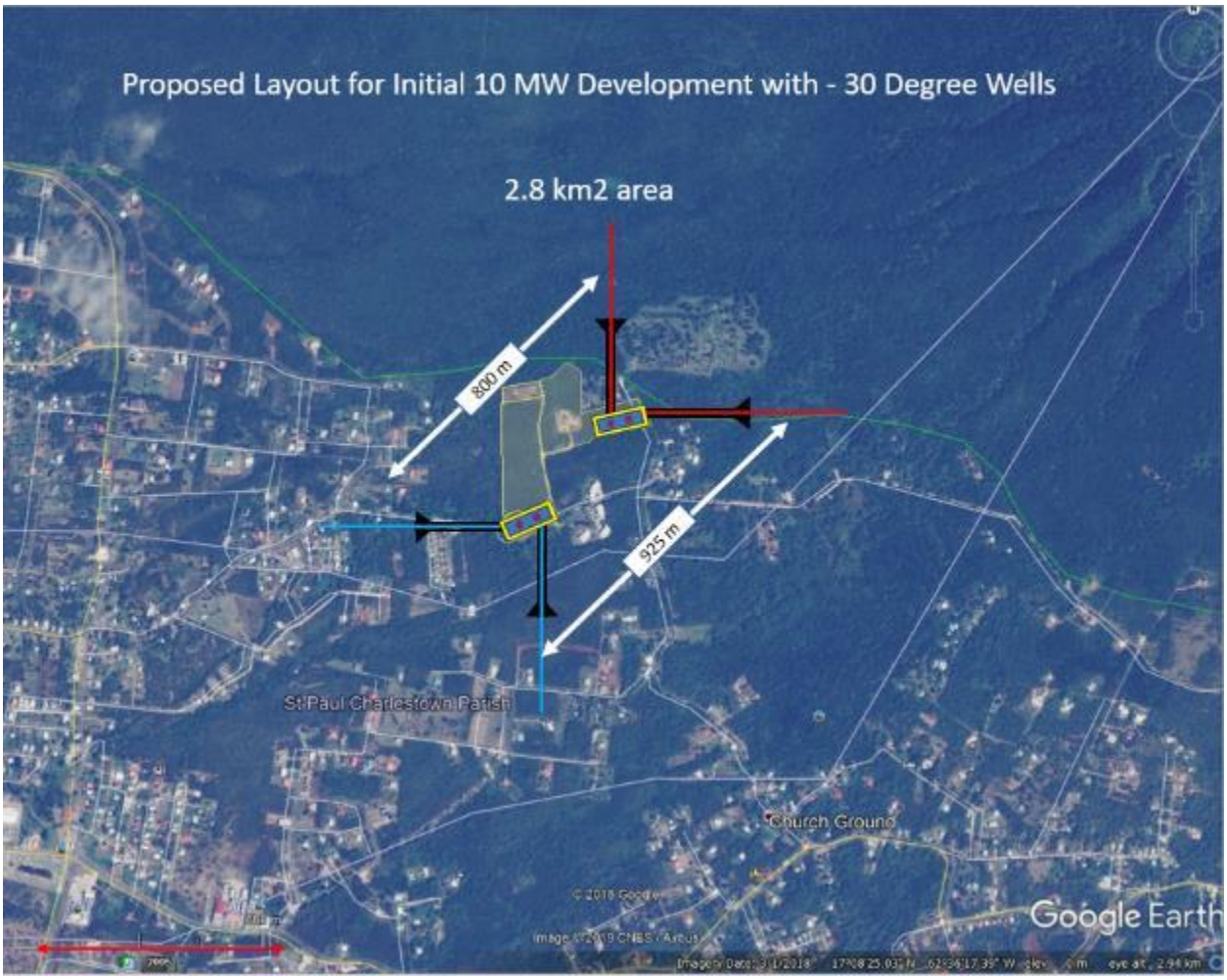


Figure Source: Schlumberger 2019

Figure 4-5. Proposed Layout for Well Pads

All of the well pads will be the same design/dimensions, at 50 meters by 100 meters, 2 cellars per pad, with 20 meters between cellars. Well pads will be compacted to meet drilling operations and rig loads (max while drilling of 250 Tons) and to withstand vehicle movements. The Cellars will be 2 meters long by 2 meters wide, and a depth of 2.5 meters, with a preset conductor (either hammered or cemented), 15 to 20 feet deep with a 30" conductor pipe. The water sumps to provide water for drilling will have a design volume of 5,000 m^3, with a mini sump to place dump fluids temporarily (volume not yet determined). These sumps will be fenced to avoid risk of drowning.

The following figures present the proposed rig positioning for the wells.

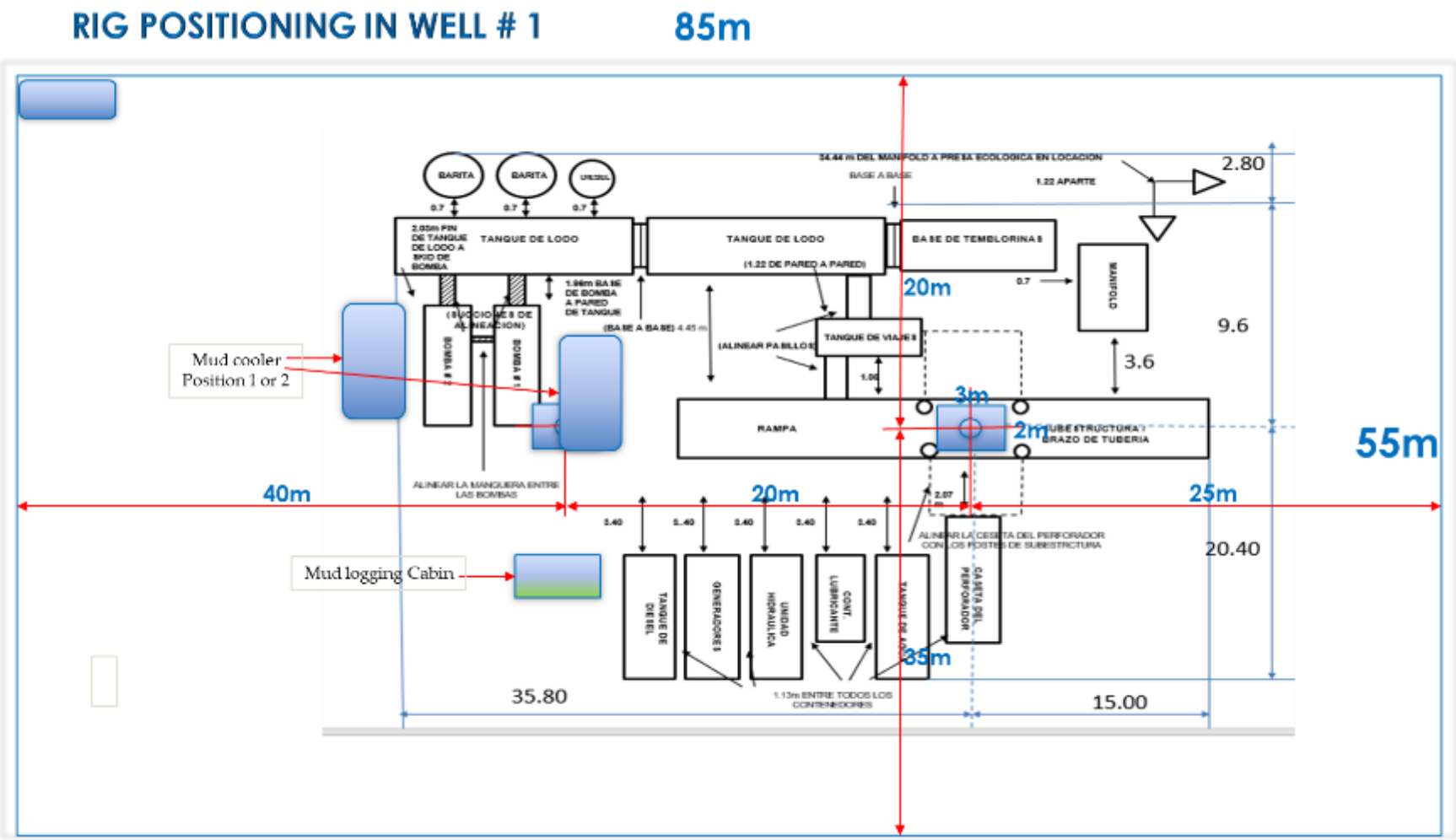


Figure 4-6. Rig Positioning Well Pad 1

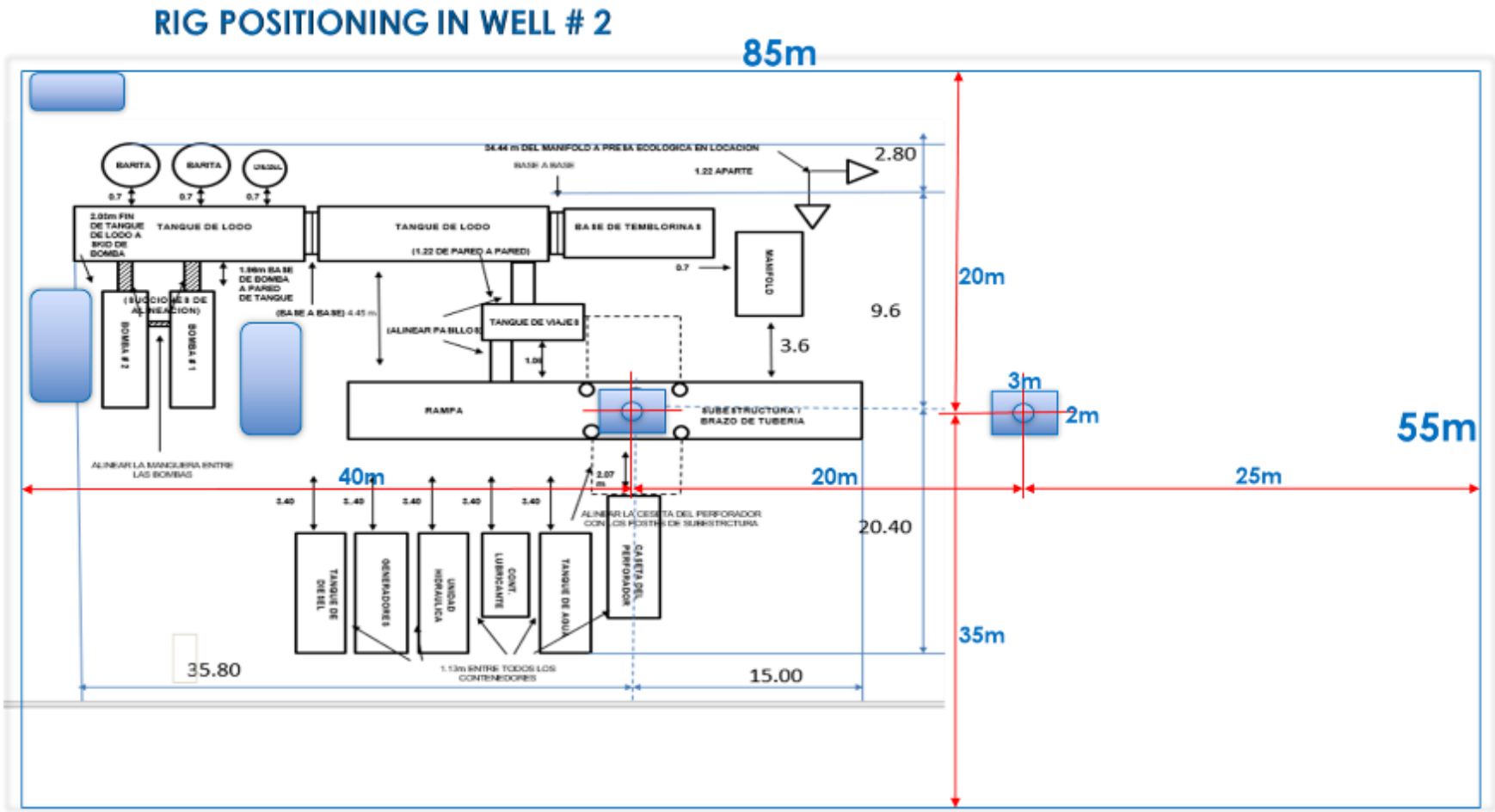


Figure 4-7. Rig Positioning Well Pad 2

The pad must also provide parking for the crew and service and delivery vehicles, have a turnaround area for these vehicles, and have a suitable area available for laydown of the mast. This lay down yard will be flat/firm ground, fenced and have a controlled road access.

A 1,500 m^2 chemical storage area will also be constructed (concrete pad or impermeable ground at a minimum), for product storage (products will be covered at all times). Area requirements include 940 m^2 for drilling fluids and 560 m^2 for cementing products.

4.3.1.2 Well Drilling

The proposed drilling rig is a Simmons rig with the following specifications:

- Type: Cantilever
- Hoisting Capacity: 750 HP
- Hook Load Capacity: 149,800 lbs
- Mud Pump Capacity: 2 x 1,000 HP
- BOPE: 21 ¼ and 13 5/8”

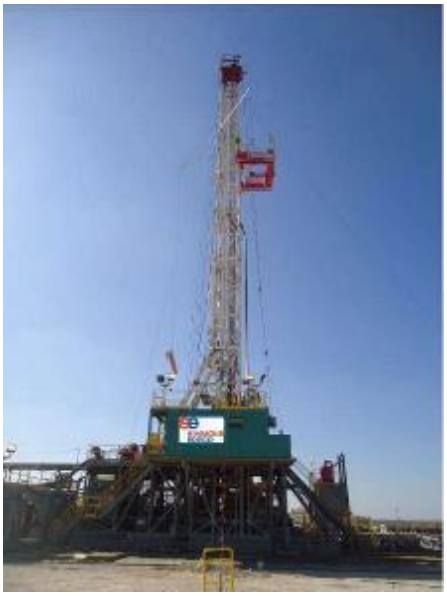


Figure source: (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019)

Figure 4-8. Example Cantilever Drill Rig

Well Specifications

The production wells would be drilled to a total added vertical depth of approximately 4,000 feet. The geothermal reservoir, based on prior drilling and geophysical exploration, begins at approximately 2,600 feet and extends to an unknown depth. The bottom hole casing is expected to be 8 5/8 inches in diameter. The casing would be fully cemented in place to at least a depth of 3,000 feet to anchor the well to the surface and isolate the geothermal system from any shallow groundwater beneath the site. A perforated liner would be installed in the production zone from a depth of approximately 3,000 feet to the bottom of the well, approximately 4,000 feet below ground surface.

The production and injection intervals of the wells will be slotted casing extending from a well depth of 2,800 feet to well bottom at 4,000 feet below ground surface (see Well Schematic Figure 4-9. Well Schematic below).

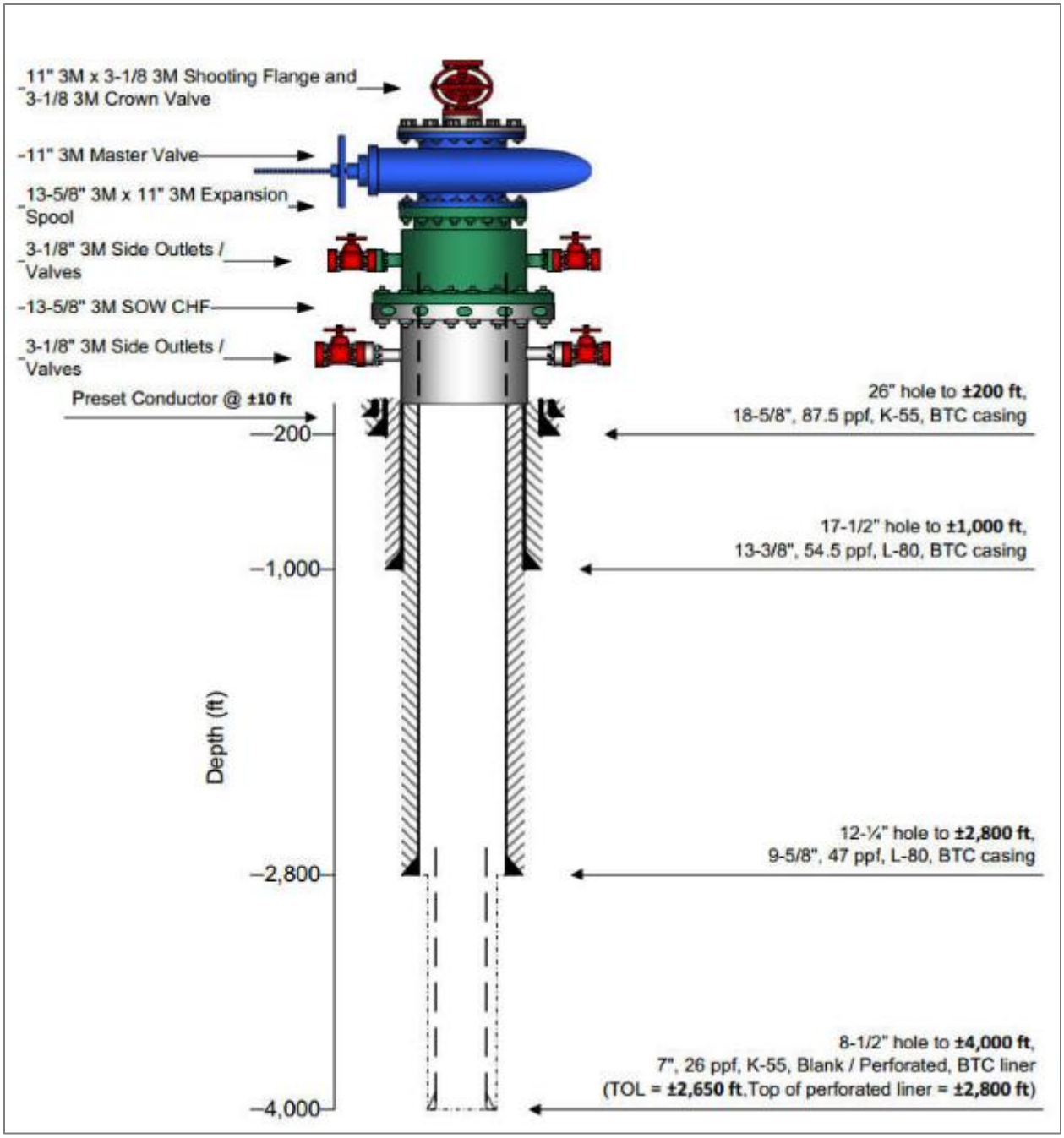


Figure Source: (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019)

Figure 4-9. Well Schematic

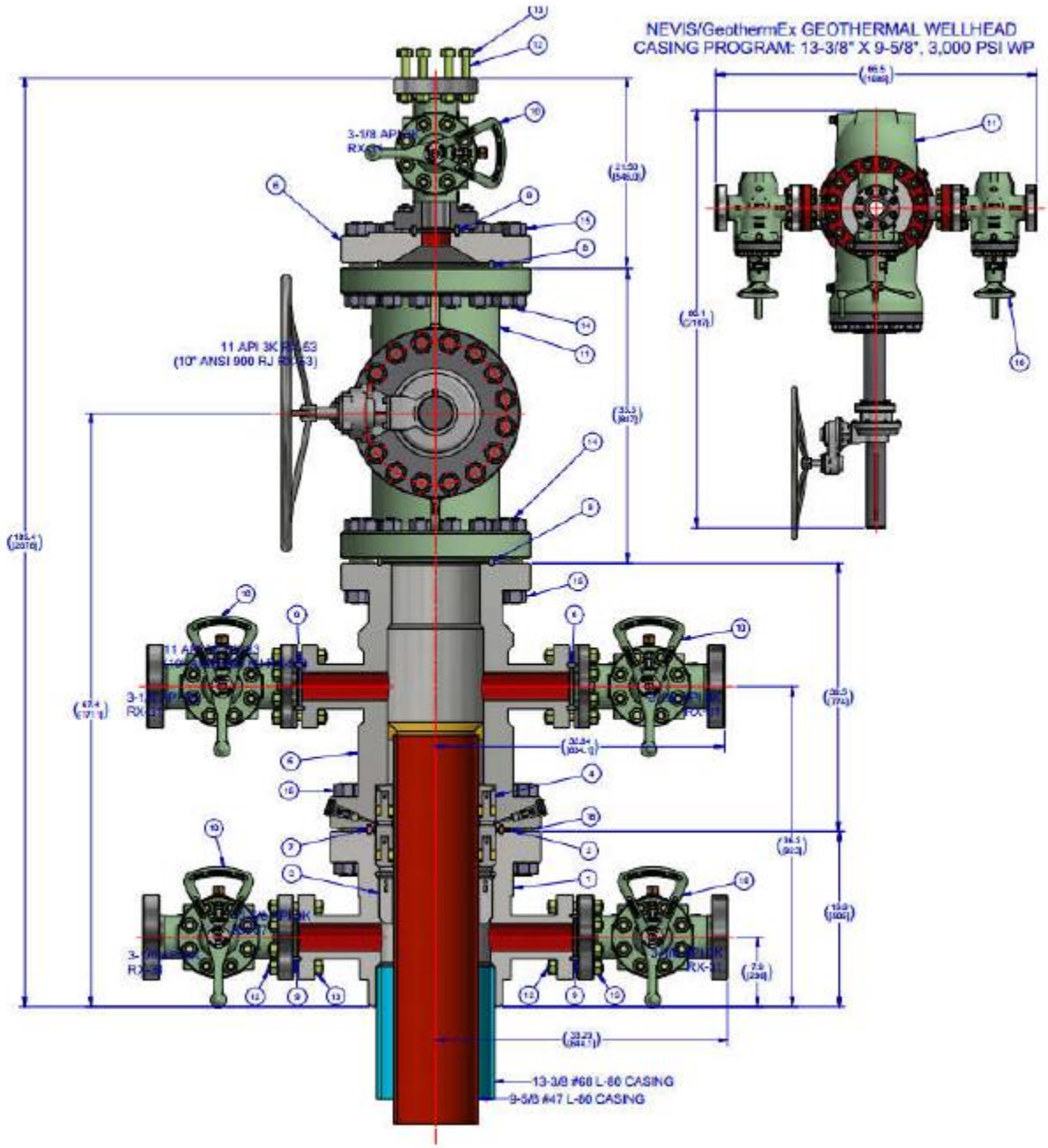


Figure Source: (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019)

Figure 4-10. Permanent Well Head

Drilling Fluids and Cuttings

Up to 10,000 gallons of water a day would be used for drilling, to be stored in a 65 m^3 capacity tank. The water would be mixed with drilling muds and additives and would circulate down the wellbore and return up the space between the drilling rod and the sides of the well (the annulus), carrying cuttings to the surface. The drill cuttings would be collected in an open container and discharged to the lined drilling sump.

F-1000 Triplex Mud Pumps (API-7K)

Specifications

Rated Horsepower:	1,000 HP
Rated Pump Speed:	140 SPM
Maximum Liner Size by Stroke Length:	6-3/4" x 10"
Suction Connection:	12"
Discharge Connection:	5-1/8" 5,000 psi Flange
Gear Ratio:	4.207:1
Valve Pot:	API #6
Approximate Weight:	41,425 lbs

Figure source: (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019)

Figure 4-11. Proposed Mud Pumps

The drilling fluid would recirculate back down the well. Most drilling additives are inert or nontoxic materials, but some additives may be classified as hazardous and require special handling. The following drilling fluids have been proposed:

Table 4-1. Mud Systems for Drilling

Hole Size/to Depth	Mud System	Process Description
26" / ± 200 ft	Gel/Polymer	The objective of this section is to drill 26 '' hole and set 18 5/8" casing at 200 ft with a Gel/Polymer system. The Drilling Fluid will be built at the rig site and sufficient volume will be available to fill the active system and maintain volume whilst drilling (building volumes, 50-80 bbls/hr.)
17 ½" / ± 1,000 ft	Gel/Polymer	The objective in this interval is to drill 17 ½" hole and set 13 3/8" casing to 1,000 ft with a Gel/Polymer system. After drilling to total depth, 13 3/8 casing will be run from surface. Prepare to increase the addition of Asphasol Supreme into the system from the initial 3ppb to 6ppb, during this section.
12 1/4" / ± 2,800 ft	Gel/Polymer	The objective in this interval is to drill 12 ¼" hole and set 9 5/8" casing to 2,800 ft with Gel/Polymer system. After drilling to total depth, 9 5/8" casing will be run from surface. The system will need to be diluted to cut back rheology for this section. Maintaining the Shale inhibitor, Asphasol Supreme at 6ppb. Dilution should be done to keep MBT[4] below 10.

[4] A test to determine the amount of clay-like materials in a water-base drilling fluid based on the amount of methylene blue dye absorbed by the sample. Results are reported as "MBT" and also as "lbm/bbl, bentonite equivalent" when performed to API specifications (https://www.glossary.oilfield.slb.com/en/Terms/m/mbt_test.aspx)

Hole Size/to Depth	Mud System	Process Description
		Treatment of drilling fluid with biocide is crucial at the end of interval before storage.
8 ½" / ± 4,000 ft	Polymer Sweeps	The objective in this interval is to drill 8 ½" hole to 4,000 ft drilling blind with seawater/high temp viscosifier sweeps. (20 bbls = ±300ft) No Gel or Barite to be used in the reservoir, unless absolutely needed. Once total depth has been reached, 7" perforated liner will be run in seawater. Fluid from previous section might be used for sweeps, and/or weighed up for well control.

Table 4-2 Proposed Drilling Fluids

Products	Function
M-I GEL	Primary Viscosifier
POWER VIS	High Temperature Polymer/Viscosifier (High temp- 325F)
Polypac HT	Primary Fluid Loss Control
ASPASHOL	Shale Inhibitor / Secondary HT Fluid Loss Control
SODA ASH	Treat Hardness / Cement Contamination
LIME	Ca+ source and Alkalinity Control
BARITE	Weighting Agent
MYACIDE	Bactericide
$CaCO_2$	Lcm
MIX II	Lcm

During drilling in the production zone, the drilling mud and the careful management of the drilling mud density balances the pressure in the geothermal reservoir, supports the borehole sidewalls from collapsing, and prohibits the release of any reservoir fluids or steam to the surface. NREI would monitor for hydrogen-sulfide and carbon dioxide continuously when drilling with gas detection sensors in the mud logging and cooling unit (see mud cooler diagram provided below). Hydrogen sulfide is commonly found in geothermal resources. It has a characteristic odor of rotten eggs at relatively low concentrations (0.005 – 0.008 ppm) and is toxic at substantially higher concentrations (100-350 ppm) (PIA, 2017).

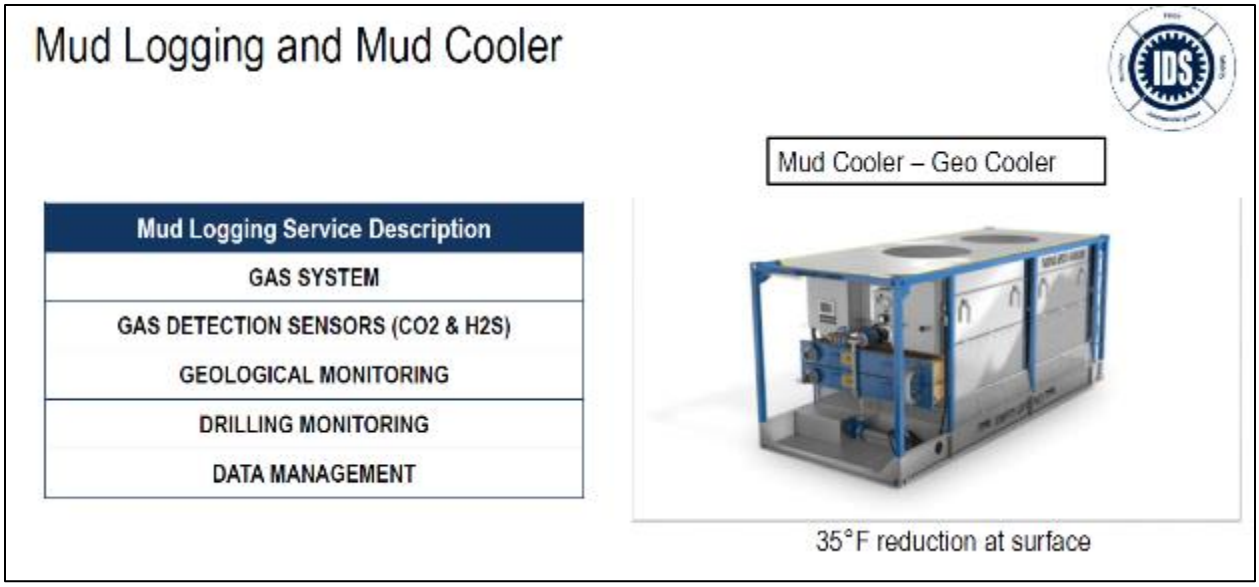


Figure Source: (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019)

Figure 4-12. Proposed Mud Logging and Cooler Unit

Gas Releases

Based on the previous sampling activities, some hydrogen sulfide may be detected at the N-3 site and surrounding area during drilling. Hydrogen sulfide can accumulate in the top portions of mud pits when there is little wind or air movement, including up to lethal concentrations. Hydrogen sulfide is highly flammable and forms an explosive mixture with air with a lower explosive limit (LEL) of 4,000 ppm; however, such high concentrations are not typical of geothermal sites.

Rig equipment and tubulars have been selected and fitted for sour service (conditions where hydrogen sulfide is present). In addition to the gas detection sensors in the Mud Cooler Equipment described above, the proposed drilling equipment includes hydrogen sulfide detection sensors and carbon dioxide detection sensors for worker safety (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019). If trace amounts of hydrogen sulfide are encountered, the drilling crew will maintain the pH at or above 11 with lime. Signs of hydrogen sulfide gas include:

- Reduction of mud pH
- Discoloration of mud (to a dark color)
- Rotten egg odor
- Formation of black scale on steel drill pipe

Continuous monitoring and recording of hydrogen sulfide and carbon dioxide will be performed at the at the shale shaker, cellar, and driller's station, and any other location to be specified by the Operator (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019).

If hydrogen sulfide gas is detected at levels that would produce unacceptable odors at downwind residences, NREI would inject abatement chemicals into the drilling rod to reduce hydrogen sulfide emissions to acceptable levels (see Section 4.4.8.2 below) (PIA, 2017).

In addition to these gas sensors, two types of degassers will also be implemented during drilling in order to safely vent pockets of gas, a vacuum degasser for drilling fluids and a poor boy degasser for muds (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019).

Blow out prevention

During drilling, an annular type Blow Out Preventer (BOP) and a ram type preventer will be implemented to be used alongside a BOP Control System with driller control panels as well as a remote control panel (see Table below) (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019).

Table 4-3. Blow Out Prevention Equipment During Drilling

BOP EQUIPMENT	
Annular	
Quantity:	1
Make:	Townsend
Type:	90
Size:	11"
WP:	5,000 psi
Connection Top/Bottom:	Stud Top Flanged Bottom
Closing System:	Hydraulic
Ram Type Preventer	
Quantity:	1
Make:	Townsend
Type:	82
Single/Double:	Double
Size:	11"
WP:	5,000 psi
Side Outlets	
- Quantity:	4
- Size:	4 1/16"
- Max. Working Pressure:	5,000 psi
Connection Top/Bottom :	Studded
Number / Size of Pipe Rams:	1 Set 4"
Number of Blind Rams:	1 Set
Choke Lines	
Quantity:	1 - 3 1/8"
Working Pressure:	5,000 psi
Kill Lines	
Quantity:	1
Working Pressure:	5,000 psi
Manual Valves	
Quantity:	3 - 3 1/8"
Working Pressure:	5,000 psi
Hydraulic Valves	
Quantity:	1 - 3 1/8"
Working Pressure:	5,000 psi

Source: (Schlumberger, 2018)

During operation, the wells will be equipped with blow out prevention equipment (BOPE) at the well heads below the main valve, which would shut in the well if an uncontrolled flow were to occur. NREI would have independent contractors inspect the BOPE to ensure that the equipment operates and conforms to industry standards and has redundant features to control unexpected flows (PIA, 2017).

Drilling Power

Power for drilling will provided via three onsite diesel powered generators (914 HP – 1477 HP). Diesel used for drilling would be stored in double-hulled diesel storage tanks (24.6 m^3) with secondary containment capable of storing 120% of the capacity of the tanks (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019). Additional diesel from the NEVLEC Prospect Power Plant, approximately 1.1 miles southwest of the site, would be trucked to the site, if needed. The fuel storage tanks and drilling lubricants and additives would be stored in a designated area with impermeable surfaces. The storage area would be bermed to contain potential spills and any contaminated stormwater (PIA, 2017).

Well Testing

Once drilled, NREI would test the production wells to determine their flow rate and to establish the key reservoir properties. A formal well test procedure for the Project is currently being prepared. During testing of the production wells, NREI will use a separator/muffler that receives two-phase flow through a valve system attached to the wellhead and separates the steam from the water at a set pressure. Orifices, a James Tube, and gauges in the lines that lead to the discharges points would measure the flow rates, temperature, and pressure of the steam and water. During testing, the steam discharges to the atmosphere, and the water discharges through a weir box to measure the flow. Water flow is measured in the weir box while steam flow is calculated based on pressure and temperature. Sample taps would allow for the collection of water, gas, and steam samples. The mud from the borehole will be evacuated into the well pad mud pits where drill cuttings are allowed to settle prior to the mud being recirculated back into the borehole. Fluid produced during short well test activities would be directed into the 5,000 m^3 storage pond. During long term testing, when injection wells are already available, the produced fluid would be injected into the injection well. Testing could last for several days up to two weeks, depending on the results of the drilling (PIA, 2017).

Although the proposed binary technology would avoid emissions of geothermal pollutants during power plant operations, some hydrogen sulfide may be released during well testing. The analyses of the NCG collected during the March 2018 well testing done by GeoTherm found concentrations of hydrogen sulfide approximately one-third lower than the 2008 drilling samples analyses. These lower concentrations of NCG in the production zone reduces the likelihood of needing to treat the hydrogen sulfide released during well testing. Air quality monitors at the drilling site did not detect any concentrations of the odorous gas during the 2018 testing, therefore no treatment was required (Point Impact Analysis, 2020). Injection of sodium hydroxide and hydrogen peroxide into the vented steam can convert the hydrogen sulfide to soluble sulfates that can be injected and reduces the hydrogen sulfide released to the atmosphere. NREI would have storage tanks with sufficient quantities of 25-30 percent aqueous solution sodium hydroxide and 50 percent hydrogen peroxide on site to abate the potential emissions during any further testing of the production wells (see Section X below for hazardous chemicals used on site) (PIA, 2017).

4.3.2 Geothermal Fluid Conditions

The design of the Geothermal Organic Rankine Cycle Power Plant is based on the geothermal fluid (heat source) characteristics presented below (EGESIM and AtlasCopco, 2020).

Table 4-4. Geothermal Fluid Characteristics used for Plant Design

Characteristic	Unit	Site Value
Geothermal fluid flow (Brine + Vapor + NCG)	t/h	182.01
Steam	t/h	28.14
Brine	t/h	153.9
NCG flow	t/h	0.369
Reference geothermal fluid inlet temperature brine	[°C]	178.4
Reference brine pressure	bar(a)	10.75
Reference steam pressure	bar(a)	9.75

4.3.3 Binary Power Plant

The proposed NREI binary geothermal plant, would consist of two side by side Organic Rankine Cycle (ORC) systems each with their own vaporizer and vapor preheater, radial inflow expander (turbine) coupled to a generator, air-cooled condensers, a recuperator, a vaporizer and preheaters, using n-pentane as the working fluid.

The preliminary design input parameters for the proposed binary Nevis geothermal project are as follows:

Table 4-5. Design Input Parameters

Description	Value
ACC air inlet temperature at 1m below bundle	27 °C
Geothermal fluid vaporizer inlet temperature	178.6 °C
Geothermal Brine fluid flow	153.86 t/h
Steam+NCG flow	28.138 t/h
Geothermal pressure	10.75 bara
Reinjection temperature	109.3 °C
Geothermal fluid enthalpy/cp	4.34 KJ/(kg*K)
NCG content of geothermal fluid[1]	1.26 % in vapor

[1] a sample should be analyzed and the correction curve corrected accordingly

Source: (EGESIM and AtlasCopco, 2020)

The ORC net power output based on the above design parameters is 4,906 kWe, so for two ORC units, net power is 9023.1 kWe (including all losses).

4.3.3.1 Geothermal Fluid Cycle

Geothermal production wells deliver a mixture of vapor and brine. This two phase flow from each well is carried through a two-phase flow pipe into a Vertical Separator where brine and vapor (consisting of steam and non-condensable vapors = NCG) is separated.

- Vapor - the main use for the vapor portion is to deliver heat for vaporizing and superheating the ORC working fluid in the Vaporizer, and
- Liquid - the liquid from the separator is taken into the Preheater for heating the working fluid (pressurized seal gas) up to boiling temperature.

Once both flows have been through the complete cycle, they go to the Condensate System which controls what is fed to the reinjection wells.

4.3.3.2 The ORC Cycle

The Circulation Pumps deliver the high-pressure working fluid first to the shell side of two parallel Recuperators to heat the working fluid downstream at the Expander entering the tube side of the Recuperators. The working fluid feeds the Preheater by increasing temperature of the fluid.

Inside the Preheater the working fluid is heated up to a point close to the boiling point. The heat exchanger has a standard shell and tube design with the working fluid on the shell side, and the resource fluid on the tube side to facilitate cleaning of the tube side.

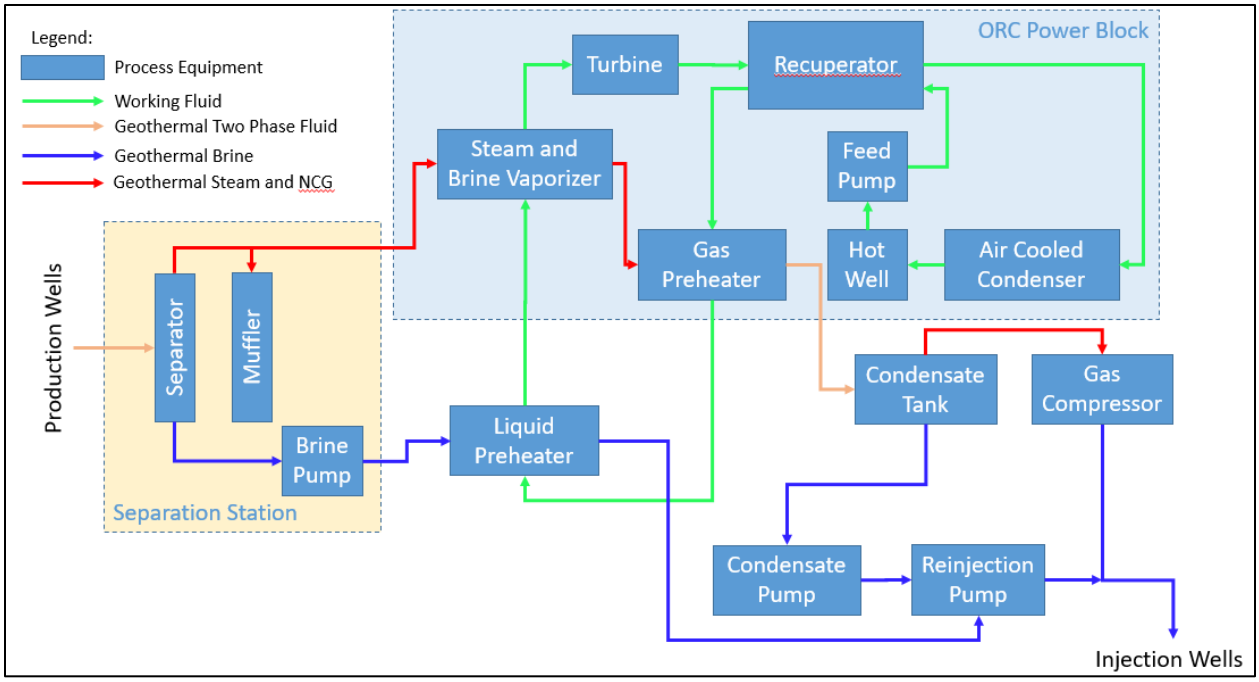
After the Preheater, the working fluid enters the (tube multi-pass) shell and tube Vaporizer. The boiling working fluid is on the shell side, and the brine and vapor on the tube side. The working fluid evaporates on the outside of the tubes and leaves the Vaporizer in the superheated condition through a Mist Eliminator, which removes any droplets which may be present in the vapor.

The working fluid vapor then enters the turbine or Expander. The Atlas Copco radial inflow expander proposed for the Project has variable guide vanes, which control the flow of the working fluid into the turbine. The variable guide vanes are designed in a way that they ensure best inlet angle of the flow into the expander wheel, regardless of the working fluid flow or turbine load. The variable guide vanes control Vaporizer and Preheater pressure as well.

The ORC working fluid leaves the turbine and enters to the tube side of the Recuperator, heating the shell side working fluid coming from the Feed Pump. In the ACC, the vapor condenses into liquid after exchanging heat with ambient air. The tube surface on the air side is designed with fins to increasing the heat exchange surface area. The Hot Well collects the working fluid condensate and functions as a Buffer Tank with sufficient height to protect the feed pumps from cavitation.

Electrically driven fans ensure adequate air flow over the tube bundles with the pressure controlled working fluid in the Hot Well Tank to eliminate excess sub-cooling.

Finally, the (condensed) liquid working fluid is circulated back into the ORC cycle via the Feed Pumps.

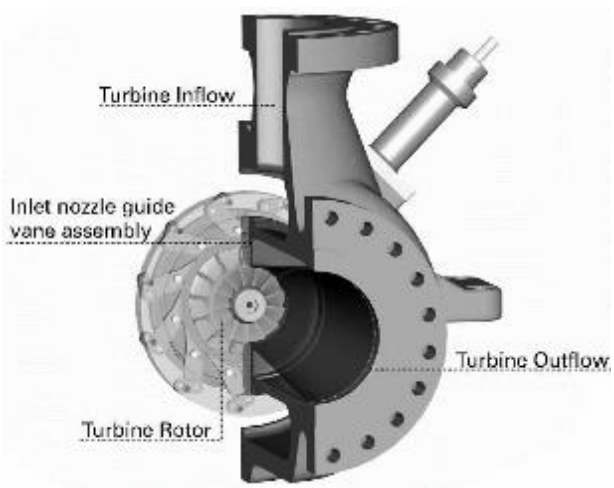


Source: ERM 2020

Figure 4-13: General Process Flow Diagram

4.3.3.3 Expanders

The key feature of the ORC plant is the generator loaded radial inflow expander package with integral gear, lube oil system, seal vapor system and equipped with variable Inlet Guide Vanes (IGV). The radial design as opposed to an axial flow design improves the overall efficiency of the generating train and provides the same power output with less flow from the wells. The generator is located together with Expander on common foundation and is connected to the expander via a removable coupling.



Source: (EGESIM and AtlasCopco, 2020)

Figure 4-14. The Atlas Copco Radial Inflow Turbine

Trip Valve

The trip valve is an automatic controlled butterfly valve located on the turbine process vapor inlet. The trip valve has a fail to close function meaning that if the actuator power source is lost the valve will close automatically. For safety reasons the trip valve has a very short closing time (EGESIM and AtlasCopco, 2020).

Seal Gas System

Pressurized Seal Gas (PSG) is the pressurized working fluid used to prevent any leakage from the impeller side to the gearbox side. An inert gas (pressurized nitrogen) prevents the PSG flow towards the gearbox side. If there is a leak through the seal, the PSG is mixed with the inert gas and goes out through the seal bleed port to atmosphere (EGESIM and AtlasCopco, 2020).

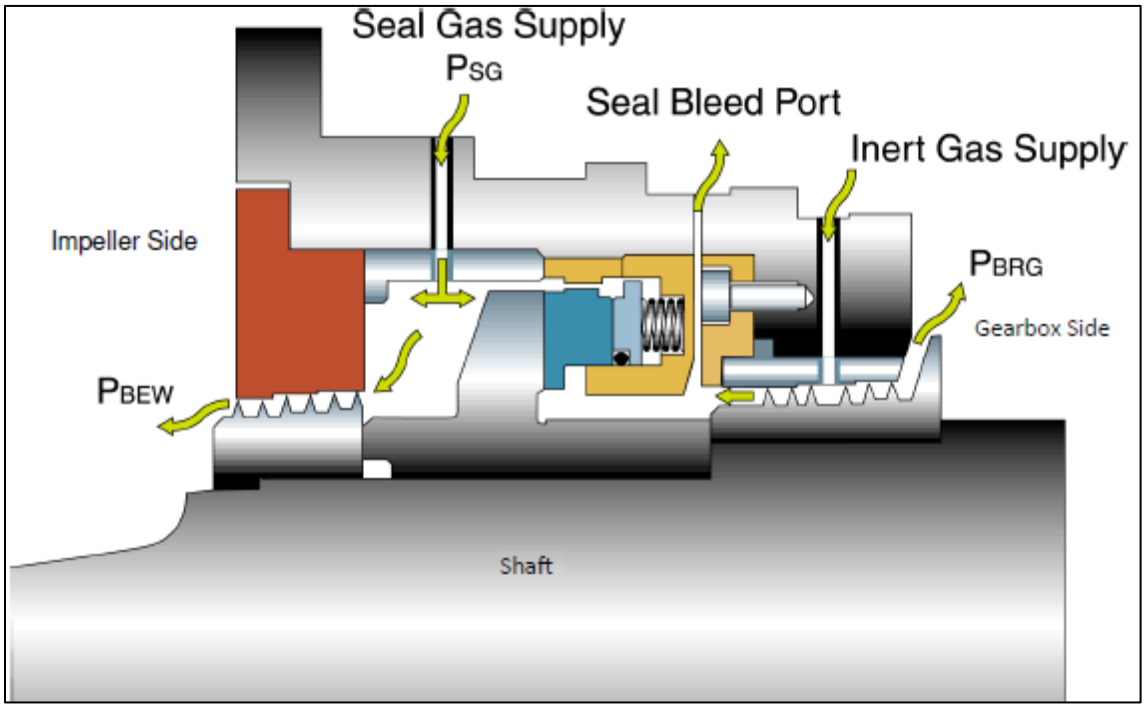


Figure source: (EGESIM and AtlasCopco, 2020)

Figure 4-15. Seal Gas System

Two 90 m^3 pressurized gas storage tanks will be maintained on-site to be filled by trucks at a truck loading area.

Synchronous Generators

The synchronous generator is a horizontal axis, three phase Generator with a hazardous area classification according to site specification. It is equipped with a generator control and protection panel (GCPP), an integrated multifunctional panel consisting of a synchronization unit, an excitation and automatic voltage regulator (AVR) control unit, differential current protection, overvoltage and overcurrent protection, trip circuit supervision, and generator breaker failure protection. Bearings are supplied with oil by a common lube oil system with the expansion turbine and cooling of the generator is air to air on the application.

Lube Oil System

The lube oil system is common generator and turbine. The main components of the lube oil system are pumps, filters, cooler, reservoir, demister, valves and pipes and fittings. The main oil pump is a positive displacement shaft driven oil pump mounted on the gearbox.

The auxiliary oil pump is also positive displacement pump electric motor driven and mounted on the reservoir. The oil cooler is air cooled on the application. The filter is a double switchable filter assembly allowing cleaning of one filter during full operation.

4.3.3.4 Air Cooled Condensers

The Air-Cooled Condenser (ACC) consists of series of tube bundle assemblies, interconnecting pipes, walkways and a supporting steel structure to satisfy the required elevation of the tube bundles for efficient airflow. Each four-tube bundle has one fan and the bundles are lined up in two rows due to space limitation.

The tube bundle assembly consists of a tube bundle, fans and the bundle steel frame. Each tube bundle forms a square stack of finned carbon steel tubes. Each tube of the stack is welded to common end-boxes on both ends. Pipe nozzles extrude from the end-boxes and are connected by expansion loops to a common manifold both upstream and downstream of the bundles. The design of the tube bundles allows separation of nitrogen and air from the working fluid. Fans are located above the tube bundles. Each fan has propeller with blades guarded by a stationary shroud, driven by an electrical motor. Power is transmitted from the motor to the propeller by a gearbox connected by a shaft.

Design currently calls for a total of 18 fans (9 per each ORC system) each equipped with a vibration switch. The steel frame consists of segments made of angles, profiles, beams, plates etc. all hot dip galvanized steel.

The tube bundles are pre-mounted on to the steel frame for support during transport and erection. Fans, motors, gearboxes, walkways and accessories are assembled and bolted to the common steel frame during erection.

Each nozzle on the ACC end-boxes is connected by an expansion loop to a horizontal common manifold on each side of the ACC. The upstream manifold is connected to the expander turbine discharge line and the expander turbine by-pass line.

The downstream manifold called the condensate header is designed to serve as an additional hot well of the ORC cycle. The diameter of the header pipe is designed large enough to store certain amount of the process fluid. The downstream manifold is connected to the Hot Well Tank where the level and pressure is controlled to optimize ACC Cooling with fans and to prevent any cavitation occurrence upstream the circulation pump.

4.3.3.5 Feed Pumps (Circulation Pumps)

The circulation pump also known as feed pump is an assembly of a vertical can pump, motor, strainers, isolation valves and minimum flow valves. The pump is a centrifugal type pump specially designed for low net positive suction head value. A bowl assembly is attached to a vertical shaft discharge column. The bowl assembly and the column are enclosed by a can. On top of the discharge head is the driving motor fastened and directly connected by a coupling. The discharge head is fastened on to a concrete foundation with the can hanging down into a well beneath.

The pump is equipped with mechanical shaft seal to prevent process fluid escaping to the atmosphere. Vibration is monitored on the pump housing and temperature is monitored both on the pump and the motor.

On the suction side of each pump is a conical filter equipped with isolation valves for maintenance and a pressure drop transmitter. On the discharge side is a check valve and an isolation valve for maintenance. The pump requires a minimum flow that is maintained by a control valve reverting the discharged fluid back to the Hot Well Tank.

4.3.3.6 Recuperator

The Recuperators (two) take the excess heat in the vapor at the turbine outlet above saturation and use it to preheat the working fluid after the feed pumps. The heat exchanger (Recuperator) has a standard shell and tube design with the working fluid vapor downstream of the Turbine on the tube side, and the liquid working fluid from the Feed Pumps on the shell side.

4.3.3.7 Preheaters

Gas

The Vapor Preheater is a horizontal counter flow shell-and-tube heat exchanger with the process fluid on the shell side and the Geothermal Vapor composed of Steam and NCG on the tube side. The use of the Vapor Preheater is to benefit the excess enthalpy in the vapor downstream from the Steam Vaporizer.

Liquid

The Liquid Preheater is a horizontal counter flow shell-and-tube heat exchanger with the process fluid on the shell side and the Geothermal Brine on the tube side.

4.3.3.8 Steam and NCG Vaporizer

The Steam and NCG Vaporizer is a horizontal shell-and-tube heat exchanger with the process fluid on the shell side and a mixture of geothermal steam and NCG on the tube side with several passes.

Process fluid inlet nozzles are located on the bottom or side of the shell. Outlet nozzles are vertical and located on the top of the shell. Nozzle for pressure safety relief equipment on the shell side is located on top of the shell (see Plant Safety Systems Section 4.3.7.1). An extra nozzle for NCG extraction on the tube side is located on the channel. The vaporizer is equipped with the necessary drain and vent nozzles both for operation and maintenance. All nozzles are designed for the applicable nozzle load and equipped with flanged ends.

The Vaporizer is structurally designed according to the relevant standards (see Design Standards in Section 4.3.7.1), supported by steel saddles with one fixed support and the other one sliding. The sliding saddle includes sliding plate and embedded anchor plate. Design of the vessel takes into account the local seismic loads as well as the static and dynamic loads for normal operation. In addition, the Vaporizers are equipped with liquid surface level gauges, level transmitters, level switches, temperature and pressure transmitters.

Thermodynamic design considers fouling and scaling on the tube side since fouling is mostly expected due to geothermal fluid chemistry. Corrosion allowance is considered both on the shell and tube sides; however is considered very low on the shell side due to the non-corrosive process fluid on the inside.

4.3.3.9 Process Piping

The process piping is divided into four sections:

1. High pressure liquid section from discharge flange of the circulation pump to the vaporizer inlet flange. The process fluid is in liquid phase state and at circulation pump discharge pressure.

2. High pressure vapor section from the vaporizer outlet flanges to the turbine inlet flange and the upstream flange of the turbine bypass valve. The process fluid is in vapor phase state and at circulation pump pressure.
3. Low pressure vapor section from the turbine discharge cone flange to the condenser terminal point. The process fluid is in vapor state and at condensing pressure.
4. Low pressure liquid section downstream the Condenser manifold, Hot Well Tank to the suction flange on the circulation pump. The process fluid is in liquid state and at condensing pressure.

The process piping and materials are designed according to the relevant standards (see next Section) considering thermal expansion, seismic load, wind, insulation weight, snow etc. For thermal expansion compensation of pipe sections expansion joints are installed. On the low-pressure vapor section also known as the turbine discharge line pressure balanced expansion joint is located downstream of the silencer. Other expansion joints may also be needed depending on the application.

All pipe sections are designed with minimum slope of 2% for self-drainage of the process fluid. Drain nozzles are located on low points and vents locations specially selected considering purging of individual pipe sections between isolation valves. Location and amount of isolation valves takes into account service and maintenance as well as special requirements depending on the application.

4.3.4 Pipelines

Aboveground 12 to 14-inch pipelines would connect the two production wells to the steam separator at the plant site. The production pipelines would be approximately 1,000 feet long and would be within the Hamilton Trust lease boundary. These will be stainless steel insulated pipe with welded joints, on supports, and would bridge the small drainage that runs through the site. Loops would be installed as necessary to allow for thermal expansion in the pipes. The exact route will be surveyed during the final design phase; however, the figure below depicts their current proposed location.

Figure 4-16: Proposed Location of Pipelines

Approximately 1,700 feet of 24-inch pipeline would carry the return flow from the binary plant to the injection well at the Hamilton Stable parcel. The insulated, aboveground pipeline would be located on crown lands adjacent to the existing estate roads and would have horizontal expansion loops that would extend away from the roadway. The pipeline would be buried or elevated where it crosses the estate road. Barriers or posts would protect the pipelines from traffic along these public roads.

The piping system would include valves and instrumentation to control and monitor the flow of resource from the production wells to the plant and from the plant to the injection well.

4.3.5 Scaling Control

An important parameter that must be considered for the efficient design and operation of a geothermal plant is management and control of the scaling potential from the produced geothermal fluids. Geothermal fluids are typically at or near supersaturation for various elements, especially calcium, magnesium, silica and iron. As the fluid flows through the wells, temperature and pressure changes can result chemical equilibrium changes that if left untreated can lead to well bore clogging, restrictions in the capabilities of the heat exchangers, and ultimately, complete loss of production from the producing wells, injection wells, or heat exchangers.

GeothermEx and PowerChem, a division of ChemTreat, Inc., were retained to evaluate the scaling potential of the geothermal fluids at the site and provide a scale inhibitor and management program. Analyses of fluid samples collected during production tests of the N-3 and N-4 wells at the Nevis project (as first described in GeothermEx, 2018b) indicate that these wells discharge a mature geothermal fluid that is in equilibrium with temperatures of at least 489°F (254°C) in N-3 and 475°F (246°C) in N-4. The fluid composition of the two wells is similar and indicates a sea water dominated reservoir, whose fluid at

elevated temperatures is NaCl type geothermal water with low Mg and SO4 but high Ca. The inferred brine chemistry is like that of seawater-dominated geothermal systems elsewhere that are utilized for power generation. Overall, the reservoir fluids are assessed to be relatively benign and should not present any significant difficulties with production, if appropriate attention is given to inhibition and metallurgy.

Based on their analysis, the Issues that will require further consideration during long-term production include:

- High silica content (N-3 contained 739 mg/ kg silica in brine flashed to 199 psig), and silica saturation modeling indicates that amorphous silica scale may begin to deposit at pressures below 130 psia (~176°C).
- High salinity and somewhat acidic nature of the produced brine could result in high corrosivity. This should be manageable with appropriate metallurgy and corrosion mitigation practices.
- Calcite scale control (by introduction of inhibitor downhole) may be needed, although the pH of the flashed water is notably low, which may prevent significant scale deposition and reduce the need for further treatment.

Design of the scale inhibiting program (including dosing, monitoring, and equipment) will be finalized once the long term flow test has been completed. The proposed chemical inhibitor system currently consists of the following:

- One 10,000 liter raw water tank
- One 10,000 liter demi-water tank (post filtration and reverse osmosis)
- One 5,000 liter mixture preparation tank
- One 10,000 liter inhibitor tank, and
- One 10,000 liter stock tank.

The scale inhibitor will be used to control mineral scaling in the wellbore, production lines, plant vessels, flow control valves, heat exchangers and injection lines and wells by injecting into the geothermal circuit.

4.3.6 Brine Ponds

Spills and releases during shutdowns would be contained within the 1,320,000-gallon (5,000-cubic meter) lined containment pond, which would be able to contain approximately eight hours of brine flow from both ORC units. The containment pond would occupy approximately 0.9 acres on the lowest topographical area of the site on the western boundary. It would be approximately 5.7 feet (1.75 meters) deep.

Should a fault occur that requires the geothermal plant to be taken offline suddenly, the production wells must be shut down slowly, over a period of two to four hours, to avoid thermal shock to the production and injection wells. In the unlikely event of an outage, fluids would be diverted to the lined containment while the wells are gradually closed. The containment pond would hold the diverted fluids before being pumped to the injection wells and would ensure that no off-site flows would occur during these events.

4.3.7 Plant Control System

The control system would consist of an operator console, control processor, data recording and acquisition cabinets, local instrument links, and an engineering work station. The operator console would allow the operator to monitor all aspects of plant operations as well as to exercise control functions by changing the set points of the individual controllers, operating control valves directly, and turning equipment on and off.

4.3.7.1 Plant Safety Systems

Design Standards

The following standards were used to design the plant systems:

Table 4-6. Design Standards

Component	Design Standards
Piping	ASME B31, API 5L
NDT Examination on Piping and Vessels	ASME B31, EN45001, EN473, EN12517, EN1712, ASME IX
Valves	ANSI
Materials	ASTM, DIN, EN
Civil	Eurocode, TEC2018, ASCE/SEI7-10, ICC-2009
Fasteners	EN898-1, ASTM A 193, ASTM A 194
Firefighting	NFPA

Fire Protection

The fire protection system would consist of a fresh-water tank, an electric firewater supply pump and a jockey pump, fire mains, and local hose and spray stations. The main fire pump would deliver water to a distribution loop around the binary plant with spray stations suitable for extinguishing n-pentane fires. In addition, several hydrants with hose stations, strategically located around the plant perimeter, would be connected to the loop. The fire protection system would also include chemical powder and carbon dioxide extinguishers suitable for extinguishing electrical and small n-pentane fires.

Pressure Relief Equipment

The ORC cycle is protected by pressure relief equipment such as pressure relief valves and rupture disks. Two types of pressure relief equipment to be used depend on the application:

- Pressure relief valves: A pressure relief valve is used to relief high pressure in the high-pressure vapor section to the low-pressure vapor section if maximum high pressure is exceeded. The valve is spring returned and will open if maximum pressure is exceeded and close when pressure is below the maximum level. The discharge line is connected to the low-pressure vapor section.
- Pressure relief valve and rupture disk assembly: A pressure relief valve is located downstream of the rupture disk to minimize process fluid loss to the atmosphere in case the maximum allowable pressure is exceeded. The rupture disk holder is equipped with a pressure gage and a small check valve on the downstream side to balance pressure and monitor the closed cavity between the rupture disk and the pressure relief valve. A short discharge pipe with open end to atmosphere from the pressure relief valve is covered by a discharge guard to prevent corrosion of the valve. Location of such assembly is typically on the high-pressure side vapor section and the low-pressure side vapor section.

Detectors

Working fluid (n-pentane) detectors would be strategically placed around the binary plant facilities. An audible alarm would alert the operators if one of the sensors detects more than 120 parts per million (ppm) n-pentane, the permissible exposure limit adopted by U.S. National Institute for Occupational Safety and Health (NIOSH) for the 10-hour work day (U.S. Department of Health and Human Services, 1995). The plant personnel would be trained on n-pentane safety.

In addition, the binary project would have an evacuation plan, and a wind sock would be mounted so that plant personnel can move up-wind from a leak.

Hydrogen sulfide detectors would be placed around the well pads and testing facilities and the rock muffler. An audible alarm would alert the operators if one of the sensors detects more than 10 ppm of hydrogen sulfide in accordance with the U.S. Occupational Safety and Health Administration (OSHA) 8-hour exposure limit.

Hurricane Protection

The Plant will implement wind protection screens around the air-cooled condenser units to protect them from wind and air-borne debris during hurricanes. These barriers will be tall enough to protect the sheltered structures and engineered to withstand Category 5 winds. The slatted barriers would allow air flow to the fans but would be able to deflect or intercept air-borne debris at Category 5 wind speeds. The barriers would be installed in two lines separated by approximately 6.4 feet (two meters) with approximately 3.2 feet (one meter) of overlap on each end, providing protection while allowing access for maintenance. The hurricane protection screens would also reduce noise from the air-cooled condensers (Point Impact Analysis, 2020).

A Hurricane Response Plan will be prepared for all phases of the Project, prior to starting any work on site. The plan will identify the hurricane response team and responsibilities under each set of predicted conditions. The drilling hurricane response plan would identify the wind conditions that require modification, curtailment, or shut down of drilling operations and the hours of advanced notice needed to implement these responses. The power plant hurricane response plan would identify the design wind loading of the structures and equipment critical to power plant operations, the criteria to be followed to implement modification or curtailment of plant operations, and the procedures and precautions to be implemented when a hurricane is predicted to occur (Point Impact Analysis, 2020).

4.3.8 Hazardous Materials Storage

Hazardous materials at the site consist of the working fluid, n-pentane, oils and lubricants, and chemicals such as sulfuric acid, sodium hydroxide, and hydrogen chloride that would be used to adjust the pH of the geothermal fluids and reduce scale build-up in the wells and heat exchangers. These materials would be stored in designated areas with impervious surfaces designed to contain potential spills. The n-pentane and oil and lubricants will be kept in tanks where they will be used, while the chemicals for scale control will be maintained in the inhibitor room (see Figure 4-4. Plant Layout, above).

Workers would be instructed in the hazardous properties of these chemicals, required protective clothing, and in the proper procedures for handling, storing, and eventual disposal of these materials.

Any hazardous waste generated during construction and operation will be handled in accordance with the Hazardous Waste Management Plan. There are no hazardous waste disposal or treatment facilities on Nevis; however, hazardous waste is accepted on St. Kitts by the St. Kitts Solid Waste Management Corporation for treatment/disposal.

4.3.8.1 N-pentane

The working fluid n-pentane is a highly flammable liquid and vapor that can be fatal if swallowed or if it enters the airways. It needs to be stored in closed containers away from ignition sources such as sparks, open flames, and hot surfaces (CDH Fine Chemical, ND). It is a liquid at ambient conditions and would not vaporize if spilled. N-pentane is not on the Environmental Protection Agency list of regulated flammable substances materials that require an offsite consequences analysis in accident prevention programs (49 CFR Part 68, 68.130).

The n-pentane system is a closed loop that runs through the preheaters, turbines and recuperators, air-cooled condensers, and vaporizers. Final quantities of the system will be defined during the final design phase; however, based on the original designs these vessels could contain a total of approximately 15,000 gallons of n-pentane. Another 3,000 gallons would be stored as reserve in adjacent drainage tanks. During maintenance on vessels in the n-pentane loop, the area needing maintenance would be isolated from the rest of the system and drained into the two drainage tanks adjacent to the regenerator. Each tank would contain approximately 9,000 gallons n-pentane. The equipment in the binary system, including the air-coolers, would be located on an impervious surface with secondary containment designed to hold the entire contents of the vessels and storage tanks plus the expected 10-year, 24-hour rainfall at the site.

4.3.8.2 pH Control

Sulfuric acid, sodium hydroxide, and hydrogen chloride will be stored on-site to adjust the pH of the geothermal liquid and control scale buildup in the wells and heat exchangers. These chemicals would be stored in double walled tanks in a designated hazardous materials storage area at the plant site, away from the n-pentane system, and the well pads (see Figure 4-4 above). The area would have berms as secondary containment to contain spills and prevent them from entering stormwater runoff (to contain up to 120% of the container quantity).

4.3.9 Additional Facilities

As part of the proposed Project, several facilities would also be constructed at the site, including a main control building, a maintenance and spare parts storage building, rock muffler (silencer), fire water system, a parking lot, and a guard shack. The plant and related facilities would occupy approximately 3.0 acres of the 9.1-acre lease (see Figure 4-4 above).

A 2.2-acre laydown area would be east of the plant site for temporary storage and parking during construction. The portions of the parcel not used for the well pads, plant site, and pipelines would be landscaped with grasses and native plants.

Access to the site will be through the existing access roads. No construction activities are planned for the access road as part of this Project.

4.3.10 Transmission Lines

The present NEVLEC grid system is an 11-kV system that covers the entire island, but NEVLEC intends to upgrade certain portions of the existing system to 33-kV. NREI would install a 33-kV transformer and deliver power to the NEVLEC intertie line at the geothermal plant boundary. This intertie line would be dedicated to NEVLEC (BV, 2014).

The transmission line will be installed below ground at depths consistent with international standards for this voltage. The line would be installed in trenches, typically three to five feet deep, in a conduit encased in concrete. The planned route to the Prospect Substation would be approximately 1.7 miles (2.8 kilometers) long, as shown in Figure 4-17 below. The underground line would have road crossings and pull boxes along

the route (PIA, 2017). The transmission lines will be double-line with a fibre-optic communication line, in conduits encased in concrete.

Source: ERM 2020

Figure 4-17. Transmission Line Route

The proposed route would follow existing roads starting at Hamilton Estates, running through Blaziers Estate and Marion Heights before finishing at the Prospect Power Station via upper Stoney Grove. Where trenching alongside the road next to existing utilities is not possible, ducts would encroach on the road. The ducting would consider future development plans to avoid unnecessary soil disturbance (PIA, 2017).

To ensure that the system is adequately monitored and managed, NEVLEC would install a supervisory control and data acquisition (SCADA) system, a computer system for gathering and analyzing real time data, to permit central control of the network. To facilitate this remote monitoring, NREI would place a communication cable in conduits in the same trench with the transmission cable (PIA, 2017).

4.3.11 Site Security

In order to provide security, NREI would fence the entire parcel and construct a security guard facility at the entrance gate. Additional security generally consists of cameras and perimeter monitoring by security. NREI plans to maintain the existing trees, shrubs, and dense vegetation along the northern, eastern, and southern site boundaries and the potions of the plant site not necessary for the plant, brine pond, and production well pad. The 2.1-acre area north of the plant equipment and the area surrounding the production well pad would be maintained as vegetative screening.

4.3.12 Plant Surface Water Drainage

The 3.0-acre plant site would be at an elevation of approximately 530 feet MSL, with an embankment along the northern and eastern sides of the site and a supporting retaining wall on the western sides of the site below this elevation.

The plant equipment including the n-pentane storage tanks and air-cooled condensers would be within a secondary containment area designed to contain the 18,000 gallons of working fluid at the site, plus precipitation during the 10-year, 24-hour storm. Spills would be captured within this area, separated, if necessary, and reused. Any separated stormwater would be pumped to the brine pond. The hazardous materials such as sulfuric acid, sodium hydroxide, and hydrogen chloride would also be stored in a separate and enclosed bermed area to prevent spills from contaminating stormwater (PIA, 2017).

The remaining portions of the site would drain to natural drainage. To prevent spills of geothermal fluids within the plant site from discharging offsite, the valves to drain the secondary containment areas would be kept shut during normal conditions and would be opened when a storm was approaching.

The shallow natural drainage that currently flows east-west across the 9.1-acre parcel would be rerouted to a drainage ditch around the eastern well pad, laydown area, and plant site or would be contained within a culvert sized to handle the expected flow during peak storm events.

4.3.13 Water and Utilities

The NREI geothermal project would require water during well drilling, filling the firewater tank, and utility water for the control room. With the air-cooled condensers, no water would be needed for the binary plant cooling system. A 4-inch water main north of the site would provide up to 250 gallons per minute to fill the drilling sump and would provide most of the water supply for drilling and plant operations. Supplemental water from the Hermitage Heights Tank Farm near Charlestown, approximately one mile west of the site, would be delivered by truck.

The sanitary system for the planned facilities would consist of a septic tank and leach field at the plant site (see Figure 4-4 above). This septic system would service the security building, the administration and control building, its location will be defined during final design. .

During operation, NEVLEC would deliver power to the site, which could be used during start-ups and outages. Thus, the proposed project would not need a back-up diesel generator.

4.4 Project Phases and Schedule

4.4.1 Construction

4.4.1.1 Site Clearing

Plant construction began by clearing and grading brush and scrub vegetation only in the 5-acre areas to be developed for the plant (includes the well pad and the laydown area), and leaving a vegetated buffer around the production well pad and north of the plant (March-April 2020), see figure below. Cut and fill would be needed to provide a level area for the plant, with a bank on the eastern side of the site and a supporting wall on the western side. The cleared vegetation and any excess soil would be taken to the local landfill.

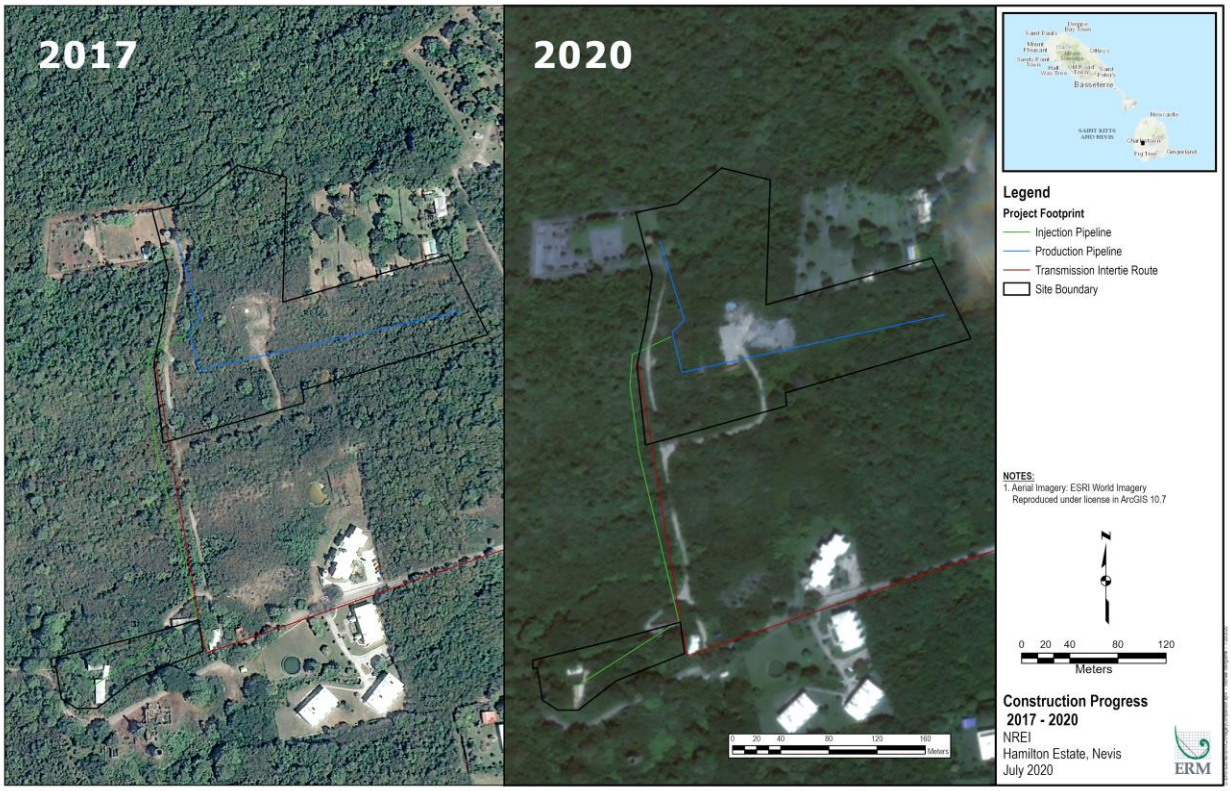


Figure 4-18: Construction Progress Since 2017

4.4.1.2 Foundations

Installation of foundations, underground utilities, pipelines, and the proposed plant equipment would follow. Cut and fill activities will be conducted to level the site. Fill will be done with crushed gravel from local sources.

4.4.1.3 Drilling

The following process will be followed during drilling activities.

1. Move In / Rig Up

2. Drill 26-inch hole to about 200 feet

3. Run 18-5/8-inch surface pipe and cement in place

4. Nipple up (N/U) the temporary casing head flange and annular / diverter system

5. Drill 17-1/2-inch hole to ±1,000 feet (drill until stable and competent formation is encountered)

6. Set and cement 13-3/8”, casing (12-1/4” drift) to surface. Perform cement top jobs as necessary.

7. Weld 13-5/8-inch casing head flange, master valve, and N/U 13-5/8-inch blow-out prevention equipment (BOPE, drifted to 12-1/4-inch).

8. Drill 12-1/4-inch hole to above first estimated target depth (±2,800 feet).

9. Set and cement 9-5/8”, L-80, casing to surface. Perform cement top jobs as necessary.

10. Drill 8-1/2-inch hole to 4,000 feet.

11. Set 7-inch, K-55, BTC blank and perforated or slotted liner on bottom.

12. Wash liner, perform injection tests as directed.

13. Demobilize - Rig Down/Move Off (RD/MO)

Rotary drilling would take place 24 hours per day and may continue for approximately 45 days (Assuming Prevention/Mitigation measures in place) (Schlumberger, 2018). The drilling contractor is contractually obligated to dispose of all drilling related waste material offsite at the local landfill. Onsite disposal of any waste material is prohibited. Hazardous waste material is not allowed to be disposed of at the local landfill. Any characteristic or listed hazardous waste produced by the drilling contractor will be containerized and shipped back to their headquarters in Trinidad for appropriate handling and disposal.

4.4.1.4 Plant Construction

According to the contract proposals, a total of 73 weeks (approximately 18.25) months would be needed to construct the proposed geothermal development project at Hamilton Estates. The construction process will begin by obtaining all the necessary permits, performing site surveys and equipment engineering (designs and layouts), followed by the site civil works (camp site layout and foundations, building constructions), then the electrical engineering and the procurement and packing and shipment of all equipment, erection of all mechanical and electrical works, and finally commissioning and plant handover.

4.4.1.5 Site Access

During construction, workers would be bused to and from the geothermal sites to reduce traffic congestion impacts. Transmission line construction equipment would be placed on the side of the road and should not interfere with traffic, but where trenching alongside the road is not possible, ducts would encroach on the road and may partially impede the flow of traffic for a limited amount of time.

4.4.2 Operation and Maintenance

The proposed NREI binary geothermal plant would operate continuously with little variation in output, relying on the geothermal resources produced from the wells at Hamilton Estates. Binary plants such as the proposed project typically have capacity factors that exceed 97 percent (U.S, Energy Information Agency Annual Energy Report 2016) Output from the geothermal project would vary slightly, as seasonal and diurnal changes in ambient temperature affect the efficiency of the air cooling system.

4.4.2.1 Start-up and Shutdown

Geothermal power plants typically shut down once a year for annual maintenance of the facilities. The proposed NREI project has two production wells and two 5-MW binary cycle generators, so that the required maintenance can be conducted on one well and one binary generator while the remaining well and generator provides power. Thus, the geothermal plant would never be completely off line except for a failure of the transmission line, which would be underground, or some catastrophic event. This configuration allows NEVLEC to decommission the existing diesel generators at the Prospect Power Plant. The NREI project would not need backup diesel generators because of the two parallel ORC systems and NEVLEC would keep one of its 2-MW generators available for backup, if needed.

During scheduled outages, operators would shut in one of the wells gradually, reducing flow through the plant and requiring little or no releases of steam and water from the separator. The steam and NCG would vent through the rock muffler; the water would collect in the brine containment pond.

If maintenance is required for the vessels containing working fluid, the area to be repaired would be isolated and the n-pentane drained and held in drainage tanks. The working fluids would be contained and stored on site and reintroduced into the system when maintenance is completed.

4.4.2.2 Emergency Shutdowns

During emergency shutdowns, such as a turbine trip or the loss of the transmission intertie line, the binary cycle would shut down. The full geothermal flow, 182.01 t/h, would vent from the steam separator with the steam released through the rock muffler and the water collecting in the brine pond. The brine pond has the capacity to hold approximately two hours of full flow. If NREI determines that the cause of the outage cannot be corrected within a few minutes, as is often the case, the operators would reduce flows, gradually shutting in the wells as the water collects in the brine pond. Full shut down can be safely accomplished in less than one hour.

Operators would shut in the wells completely before the pond reaches capacity. NREI would have abatement chemicals on site at the rock muffler but does not anticipate needing to abate the emissions during emergency shutdowns, since the release would be temporary and unlikely to result in a significant nuisance to nearby residences.

The proposed plant would have a bypass that would allow the geothermal water to flow directly to the injection line. Since the high temperature fluid from the production well could adversely affect the injection well, NREI would only use this bypass in an emergency.

After the operators determine the cause of the outage and rectify the condition, the flow would be directed back to the plant inlet, and the binary plant would resume normal operation. The use of two production wells, and two generators gives the plant the ability to conduct required maintenance and to address unexpected outages requirements by shifting the load from both production wells to one production well, and from both generators to one generator. This configuration provides for a resilient system capable to responding to required and unexpected operating conditions without adverse impacts to the NEVLEC system or the surrounding environment.

4.4.2.3 Well Workovers

After several years of operation, NREI may need to bring in a “workover” rig to improve the flow of the production wells, remove scale, or replace a downhole pump in a production well. This rig would be smaller than the rotary rig used for the production well, about the size of a 10 ton truck. The mast for the rig would be approximately 20 feet high when erected (PIA, 2017).

4.4.2.4 Site Access

During operation, the plant would have a minimal impact on traffic, plant operators would work in shifts and would not all commute at the same time.

4.4.3 Decommissioning

NREI plans to operate the proposed binary geothermal under a 25-year contract with NREI that may be extended by up to two 5-year increments. Upon completion of the contract, NREI would transfer the project to NEVLEC, which intends to continue operations and potentially expand the plant to meet growth and increasing demand. Continuing operations could require modifications to address future reservoir conditions and equipment requirements (PIA, 2017).

Although geothermal fluids will be reinjected back into the reservoir, they may experience reservoir temperature decline if the volume of the reservoir is small or if production exceeds the ability of the reservoir to recover from the heat extraction process. NREI’s contract terms require that it turn over the plant, wells,

and facility grounds to the government and NEVLEC. NIA and NEVLEC would assume all responsibility for continued responsible operations, or, if desired, decommission in accordance with applicable guidance and regulations at the time (PIA, 2017).

4.5 Workforce

The following work force numbers are expected during the different phases of the Project:

- Drilling - Drilling would require two 9-person crews plus NREI supervisors
- Plant Construction –
  - During erection: During peak construction periods, up to 75 workers would be at the site. NREI would hire from the local workforce, where possible, particularly during the initial stages of construction. Many of the construction activities would require workers with specialty skills who would live in local hotels and accommodations. An engineer shall be at site to record and monitor the erection, review of installation as applicable for completion of erection of the supplied Equipment.
  - Commissioning - Supplier will have one installation supervisor for 16 man/weeks, and one commissioning supervisor at site for 16 man/weeks. The Suppliers commissioning supervisor shall in cooperation with the Purchasers operational manager and the plant operators carry out the hot commissioning procedure. This includes the final tests and adjustments of the ORC unit under operating conditions. Additionally, the supplier will employee a turbine commissioning supervisor, Instrumentation & Control Engineer and an Electrical Engineer at site during the commissioning of the ORC power unit.
- Operation - NREI estimates that it would have 14 employees on site comprised of the following:
  - Plant Operations: a Plant Manager, two Plant Superintendents, two Electrical Technicians, two Mechanical Technicians, four Technical Operators, and one General Maintenance person.
  - Non-Plant Operations: a Controller/Accountant and an Assistant.

  Most employees would be local or retrained workers from NEVLEC. There may be one or two operators or senior technicians during the first year of operations, but would transition to local hires with remote monitoring.

4.6 Alternatives Analysis

The proposed power plant and its location were selected through a multi-criteria assessment process. The assessment covered a range of issues including:

- Technical aspects – types of renewable energy sources, site characteristics, topographical data, geological conditions, geothermal operating conditions and access requirements.
- Socio-economic aspects – land size and acquisition requirements, and aesthetics and visual impacts that could affect island tourism.
- Environmental aspects – air quality, impacts to local flora and fauna, and noise impacts.

4.6.1 No project alternative

The no Project alternative would result in the continued energy generation and reliance on diesel power plants at Nevis leaving it vulnerable to global oil price fluctuations that directly impact the cost of electricity. Additionally, it would not help meet the Government's objective of transition the Island away from its

dependence on fossil fuels for power generation and toward its goal of 100 percent reliance on clean renewable energy. The proposed project is expected to make Nevis completely energy independent.

4.6.2 Renewable Energy Source

Several renewable energy sources were considered as described below. There are no hydropower resources available on the island of Nevis so this was not a considerable option.

4.6.2.1 Solar Technology

Solar technology was also considered as an alternative. An analysis of island conditions and energy needs determined that in order to meet the generating capacity of the proposed geothermal power plant (9 MW), a solar plant with a capacity of approximately 48 MW would be required. Typical solar power plant yield is approximately 18.9% (since the sun does not provide a continuous source of energy). Approximately 5 acres of solar panels are required to produce 1 MW; therefore, in order to produce the required load for Nevis, 238 acres would be required. In addition, there would be a need for batteries in order to provide power during down times. These batteries would also require additional land (CBD, ND).

In addition to the size requirements, the island of Nevis is subject to tropical hurricanes. Although solar panels can be designed to sustain high wind conditions, they have been known to sustain substantial hurricane damage from flying debris, and substantial wind and rain.

4.6.2.2 Wind Harnessing Technology

The island already counts on a wind farm with a name plate rating of 2.2 MW operated by Windwatt (Nevis) Ltd that has been in service since August 2010. This windfarm is composed of eight GEV MP 275/32 turbines rated at 275 kW each on approximately 2.5 acres (IDB, 2013). In order to increase capacity to meet the production capacity of the proposed geothermal power plant, an additional 32 wind turbines would have to be installed, requiring an area of over 10 acres. Like solar panels, wind turbines are not a continuous source of energy, and alone would therefore not make the island energy independent. The probability of hurricanes and their damage is an additional factor to consider on the island.

4.6.2.3 Geothermal Power

Geothermal investigations focused on Nevis started nearly three decades ago. The first in-depth study was undertaken in 1992 by Geotermica Italiana, under the impetus of the Department of Technical Cooperation for Development of the United Nations (TEP, 2019). Additional studies have included:

- Regional Studies:
  - A Report for General Secretariat of the Organization of the American States – Unit for Sustainable Development and Environment, Washington D.C., Geological and Geochemical Studies in Nevis, West Indies, prepared by GeothermEx, 2005,
  - Self Potential and Gravity Study for Geothermal Exploration of Nevis. AGU Spring Meeting Abstracts, prepared by Vichabian, Y & D. Morgan, F & Minsley, Burke & Coles, Darrell & Krasovec, M., 2005,
  - Geothermal potential of St. Kitts and Nevis Islands, presented to the Eastern Caribbean Geothermal Energy Project (“Geo- Caribes”; “G-C”), Stakeholder Consultation, Roseau, Dominica – 2006, prepared by Huttrer, G.W., 2005,
  - Geothermal exploration on Nevis: A Caribbean success story. GRC Transactions, Vol. 34, 2010, prepared by LaFleur, J. and Hoag, R., 2010,

- West Indies Power Nevis (WIPN) initiated investigations to develop the Nevisian resource in January 2007. WIPN contracted Sondi and Consultants to conduct Controlled Source Audio-Frequency Magnetotellurics (CSAMT), Magnetotelluric (MT) surveys and electrical resistivity surveys,
- In 2009, GeothermEx was retained by Conduit Capital, a potential investor of WIPN, to provide a comprehensive and integrated assessment of the Nevis resource and WIPN's plans to develop the site. GeothermEx evaluated the WIPN test well data as well as the available geophysical surveys and prior studies.

■ Site Specific Investigations

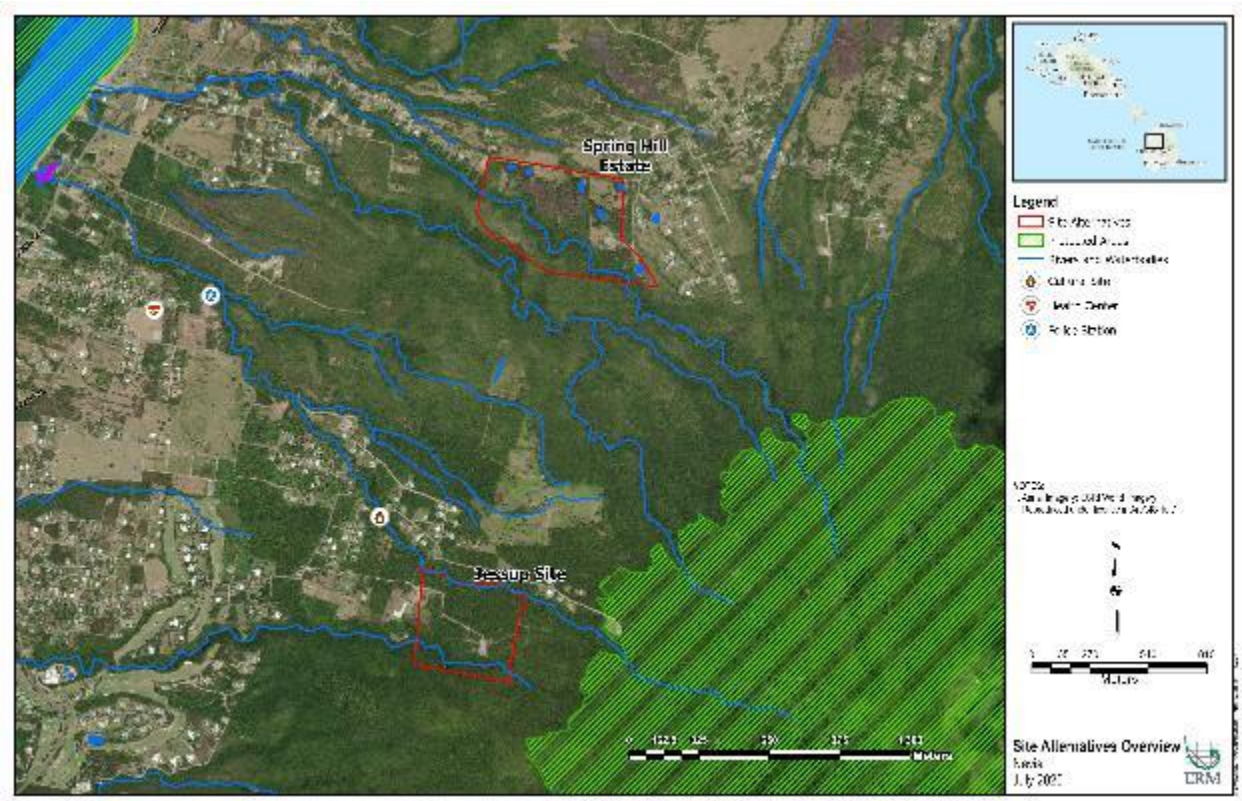
- high-resolution analysis of fault patterns using a high resolution digital elevation model (DEM),
- satellite imagery and ground cover analysis,
- field verification of faulting location and patterns,
- installation of a four test wells, flow testing and collection and analysis of water and gas samples from the test wells.

A feasibility study prepared in May 2019 provided an integrated study of all of these prior investigations and an interpretation of the data regarding the geo-thermal potential found on Nevis (TEP, 2019). Each of these studies agree on the island's potential for geothermal and their respective findings offer an exhaustive picture of a high-grade resource existing below the western part of the island and likely beyond. Limited data for the eastern portion of the Island limits the confidence of the conclusions based on the similar geologic structure and history to the western side of the island, it is inferred that the geothermal reservoir extends through the eastern areas as well.

Because of the geothermal potential findings on the island, the benefits of geothermal power with the regards to environmental impacts, the ability to become energy independent, and the amount of land required and available for a geothermal power plant, this option was selected as the most viable option to meet the Government's goal of becoming energy independent through a renewable energy source (PIA, 2017).

4.6.3 Project Location Selection

Due to the cost associate with exploratory drilling, a total of 4 wells were installed across the island in a north-south direction at three suitable locations in order to test the geothermal potential of the island. These areas are designated: the Spring Hill Estate site (where the N-1 test well was drilled), the Jessup Site (where the N-2 test well was drilled) and the Hamilton Estate site (where the N-3 and later the N-4 test wells were drilled) (see Figure 4-17 below).



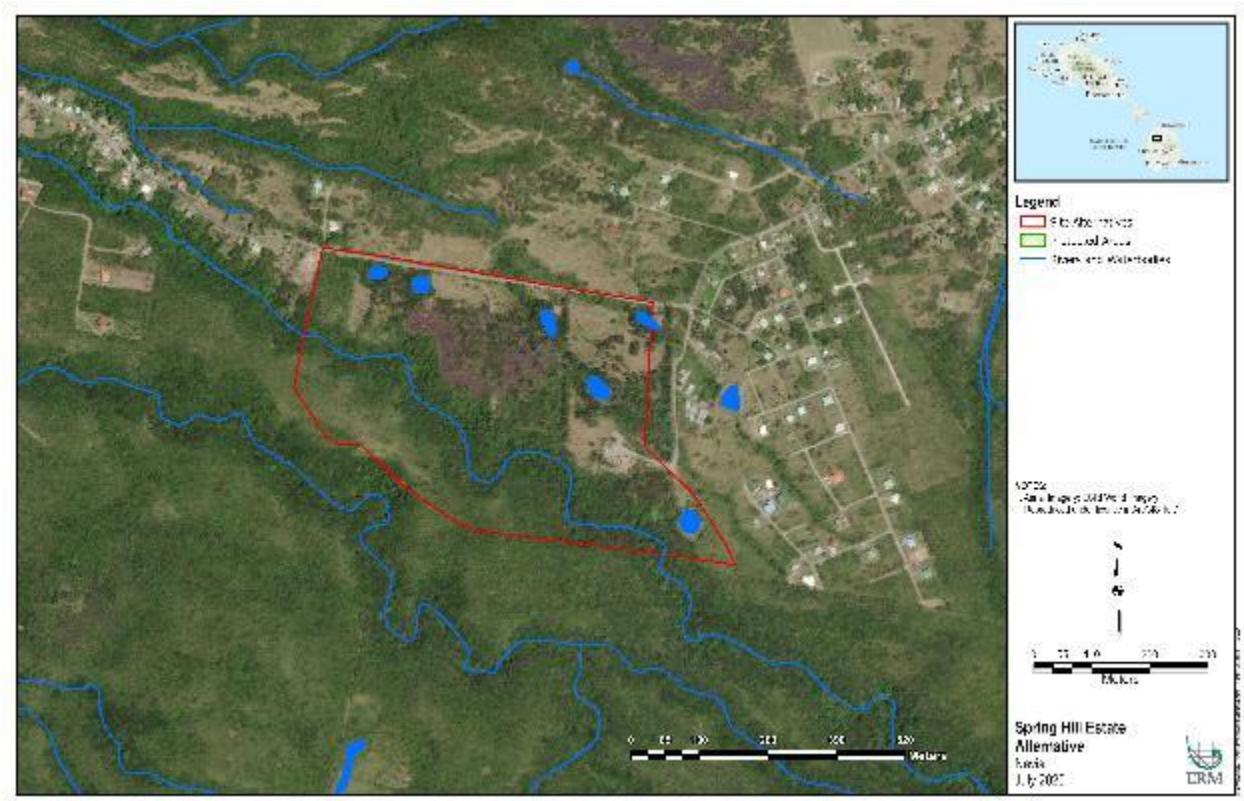
Source: ERM 2020

Figure 4-19. Alternative Locations

4.6.3.1 Spring Hill Area

The northern-most test well site designated N-1 was drilled in the Spring Hill area (see Figure 4-20 below). This site is a 76.24-acre area in St. Thomas Parish. The concession lies south of Round Hill on the northwestern slope of Nevis Peak. The site is approximately 640 feet above sea level. The area is cut by a steep banked creek meandering parallel to the southern boundary and covering roughly a quarter of the land area. A smaller, NW-SE drainage feature is found crossing the Northeastern corner of the concession. The northern two-thirds are covered by grassy lands or pastures used for grazing, and the southern third consists in forested to shrubby areas. Based on imagery analysis, there is a major streams which cuts through this site as well as the presence of multiple water bodies. The soil staining observed in the imagery suggests the presence of ephemeral wetlands within most of this site (see Figure 4-20 below).

This site is closest to the neighboring island of St. Kitts and offers a good location for power production aimed towards exportation, either to St. Kitts or other Islands to the north, in case the expansion of the Project is ever considered in the future (TEP, 2019).



Source: ERM 2020

Figure 4-20. Alternative Spring Hill Site

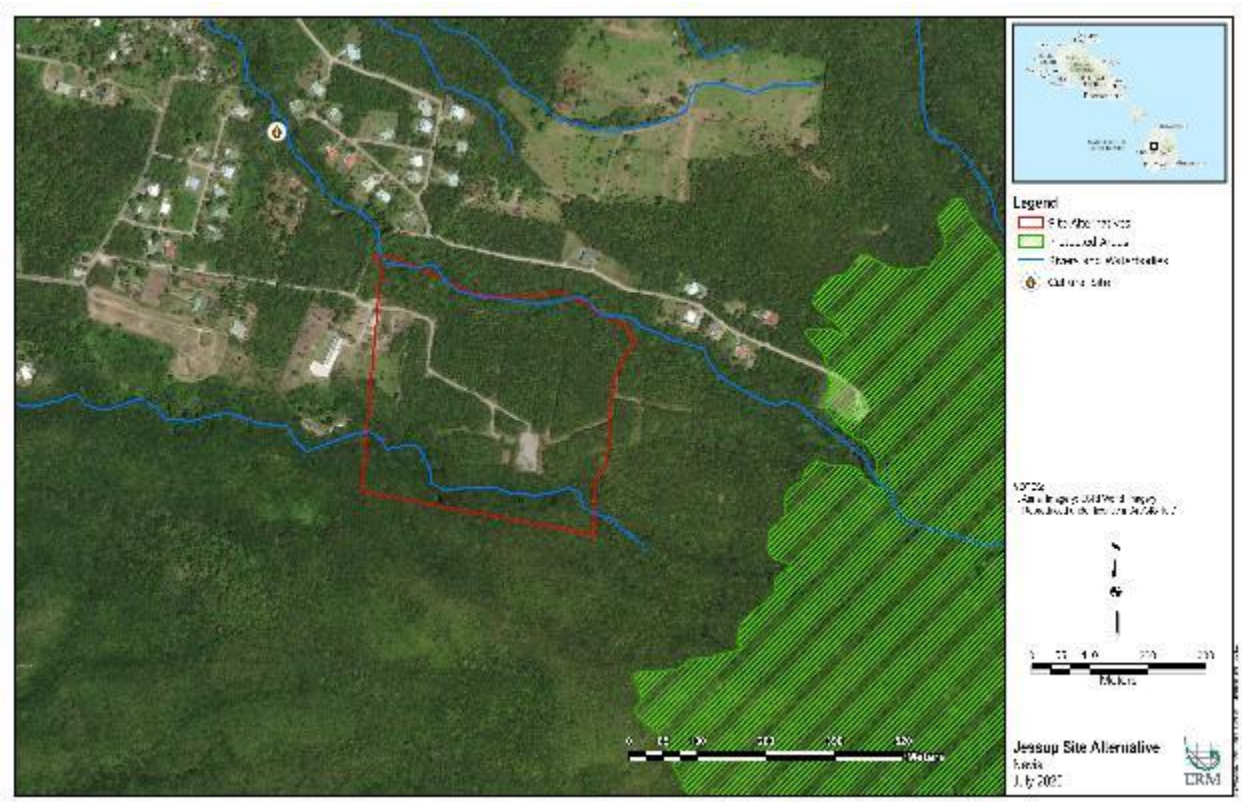
Although the N-1 well was found to have relatively low gas concentrations, and the site had little residential development immediately downwind of the plant, partial or total loss of circulation was manifested at this location at depths of 1,067 ft and 3,500 ft. N-1 encountered drilling issues with the drill string getting stuck at 1,730 ft, requiring the well to be sidetracked and mostly rotary drilled. Though it reached its intended total depth, the drill string became stuck inside the N-1 well while being pulled out of the hole, forcing the flow test to be performed with the well partially obstructed. Even with the drill pipe obstructing the well bore, it still flowed at a 5,000 lb/hr rate. Well-documented, near-isothermal conditions of 240° 250°C were found at bottom (about -3,000 ft msl), and the well self-flowed, despite the restricted section of the slim hole (TEP, 2019).

Based on the Distribution System Assessment (black and Veatch), if the plant is located at the Spring Hill Site, the closest feeder it could be connected to is the Cotton Ground Feeder. Based on existing conductor types and ratings, the maximum capacity that can be connected to the Cotton Ground Feeder without any modification to the existing circuit is 3.4 MW. If the smaller conductors are replaced, then the maximum that could be connected could be increased to 6.7 MW. For this scheme, the geothermal plant will require an 11kV substation (BV, 2014).

4.6.3.2 Jessup

A second test well designated N-2 was drilled at the Jessup site, midway between the northern and southern sites and located near the major resort complex of the Four Seasons. The Jessup site is 49 acres with relatively flat topography, at an elevation of approximately 300 feet above sea level. There is a minor drainage area that bisects the site in an east-west direction. The site has previously been cleared, and

based on imagery analysis, most of the site appears to be agricultural plots (or historic agriculture), with 1-2 structures within the proposed boundary. There are two streams that cut through this site that run towards population centers as well as to a potential mangrove near the coast. This site is also located near the historic site of the St. Thomas Lowland Church and approximately 800 feet from the protected Nevis Peak area. Utilizing a noise attenuation of 4dB per 100 ft, noise levels would be above the IFC nighttime noise level guidelines of 45 dBA at this protected area[5].



Source: ERM 2020

Figure 4-21. Alternative Jessup Site

The drilling of N-2 was stopped at a total depth of 2,567 ft below ground surface after completely losing circulation from 2,540 ft down. The well did not self-flow and therefore, a flow test was not conducted. Lack of flow may have resulted from a drilling mud cake forming along the bore hole walls as the well temperature was very high. Maximum reading thermometer measurements show a very steep temperature curve, with the hole reaching 250°C around 2,350 ft (TEP, 2019).

4.6.3.3 Hamilton Estates

The third and fourth test wells designated N-3 and N-4 were located at the Hamilton Estates location (the southern-most site), which is a 9.1-acre area with 6 additional adjoining acres in 2 parcels that may be added to the site for buffer purposes.

N-3 was drilled to 2,950 feet below ground surface. This well flowed freely with a temperature of 240°C through the obstructed well bore. The flow rate and temperature were increasing during the test and WIPN

[5] IFC General Environmental, Health, and Safety Guidelines: https://www.ifc.org/wps/wcm/connect/4a4db1c5-ee97-43ba-99dd-8b120b22ea32/1-7%2BNoise.pdf?MOD=AJPERES&CVID=ls4XYBw

chose to terminate the test early when they became concerned that they would not be able to control the flow. They calculated that the well flowed through a 2-15/16 inch diameter well bore at a rate that would have allowed 4 to 5 MWs of power generation (TEP, 2019).

The well testing results from N-4, combined with wellbore modeling, indicated that the production wells to be drilled can be expected to deliver 8.0 MW (gross) per well after assuming a 30% reduction in well capacity due to well interference.

NREI selected the N-3 site at the Hamilton Estates for its proposed project because the exploratory drilling showed that the geothermal resources at this location had the appropriate pressure, temperature, and flow for commercial geothermal production. The Hamilton Estate site:

1. Is over the intersection of two major fault lines and was the only location where the test well was successfully flow-tested, and where the magnetotelluric surveys indicated the geothermal reservoir was within practical drilling depth. Drilling success is uncertain at the alternative sites.
2. Presented concentrations of hydrogen sulfide in the N-3 production zone during the 2018 well testing that reduces the likelihood of needing to treat the hydrogen sulfide released during well testing. During drilling of N-4, there were no detects of hydrogen sulfide at the well head, mud pit or at the drilling platform and air quality monitors at the drilling site did not detect any concentrations of the odorous gas during the 2018 testing, therefore no treatment was required. Sampling of the geothermal fluid from N-4 after drilling was complete detected low concentrations of hydrogen sulfide.
3. Minimized the surface footprint of the plant facilities and intertie line.
4. Minimized the distance to the Prospect Plant distribution center.
5. Allowed the transmission intertie connection to be buried, minimizing surface disturbance in the local area and providing greater resiliency against storm events or other potential interruptions.
6. Has the shortest access road from the port, minimizing traffic disturbance to the surrounding area.

In addition, there are no water bodies on or near the site, the site is unused and undeveloped.

Expansion Capacity at the Hamilton Estates Site

In order to evaluate the expansion capacity of the site at the Hamilton Estates location, to understand whether the resource may accommodate any expansions in the future, GeothermEx was retained to evaluate that sufficient reservoir capacity was present at this location (GeothermEx, 2019). They were also tasked with providing an acceptable well layout plan that would minimize well interference over the operating life of the plant. Their analysis included a reassessment of the reservoir capacity and wellbore modeling to provide information on the number of wells required to produce a net output of at least 30 MWs. While the current Project only seeks to produce 10MWs, this information is useful in case the Project ever seeks an expansion. A summary of their analysis and conclusions are included below:

- There is a suitably large geothermal resource, and a prudent development strategy in place to successfully develop a 30 MW geothermal project. The geothermal resource covers a minimum area of 12 km^2 and may ultimately prove to cover as much as 36 km^2 on this side of the island. NREI's development plan is to exploit 5 x 15 km2 of the Nevis resource, in and around the Hamilton Estates area. NREI would propose to drill 5 production wells and 4 injection wells to support a future potential 30 MW project if said project was ever carried out. GeothermEx's volumetric heat-in place assessment indicates that there is greater than 90% probability that the development area contains more than enough heat to support the 30 MW geo- thermal project.

Overall, it is GeothermEx's opinion that the critical resource elements are in place for a successful geothermal project to be developed on the Island of Nevis. These elements include:

- Confirmation of a large, high-temperature geothermal resource
- Utilization of only a portion of the greater resource area, which increases the long-term sustainability of the project
- Confirmation (by drilling and testing) that the reservoir permeability, temperature, and reservoir fluid chemistry are suitable for commercial power generation
- Adequate separation between injection and production wells, allowing the project to balance the need for pressure support while minimizing the risk of thermal degradation
- A project design which intends to achieve 30% excess production and injection capacity to maintain operational flexibility and sustain power generation.

4.6.4 Distribution System Assessment

Based on a Distribution System Assessment performed for the existing distribution system on Nevis, a Geothermal Plant capacity in excess of 6.7 MW will require a direct connection to the Prospect Power Plant (BV, 2014).

Two possible distribution type options for connecting the geothermal plant to the prospect power plant, either overhead conductors or underground cables. There are also two possible voltage levels (11 kV or 33 kV). The overall cost of an 11 kV underground cable connection to the Prospect Power Plant is about the same as that of the 33 kV underground option. However, the 33 kV underground option will have less distribution losses and use a smaller cable size. Hence, the 33 kV underground cable option is preferred over an 11 kV underground cable option (BV, 2014).

The review of NEVLEC's distribution system regarding the possible options for interconnecting a 10 MW geothermal power plant the three possible sites (Spring Hill Area, Jessup, and Hamilton Estates), concluded that a dedicated 33 kV connection from all three of the sites is the most suitable option, both from a technical and economic standpoint (BV, 2014). Of the three sites, the estimated costs and works required were lower for the Hamilton Estate Site, with the following requirements for each site:

- Spring Hill:
  - 250 kcmil Al 33 kV cable, 10 km (single circuit, direct buried)
  - Substation at Geothermal Plant
  - 11/33 kV, 15 MVA transformer at Geothermal plant
  - 11/12.47 kV, 15 MVA transformer at Prospect Power Plant, and a
  - 11 kV Switchboard at Prospect Power Plant
- Jessup:
  - 250 kcmil Al 33 kV cable, 7 km (single circuit, direct buried)
  - Substation at Geothermal Plant
  - 11/33 kV, 15 MVA transformer at Geothermal plant
  - 11/12.47 kV, 15 MVA transformer at Prospect Power Plant, and a
  - 11 kV Switchboard at Prospect Power Plant

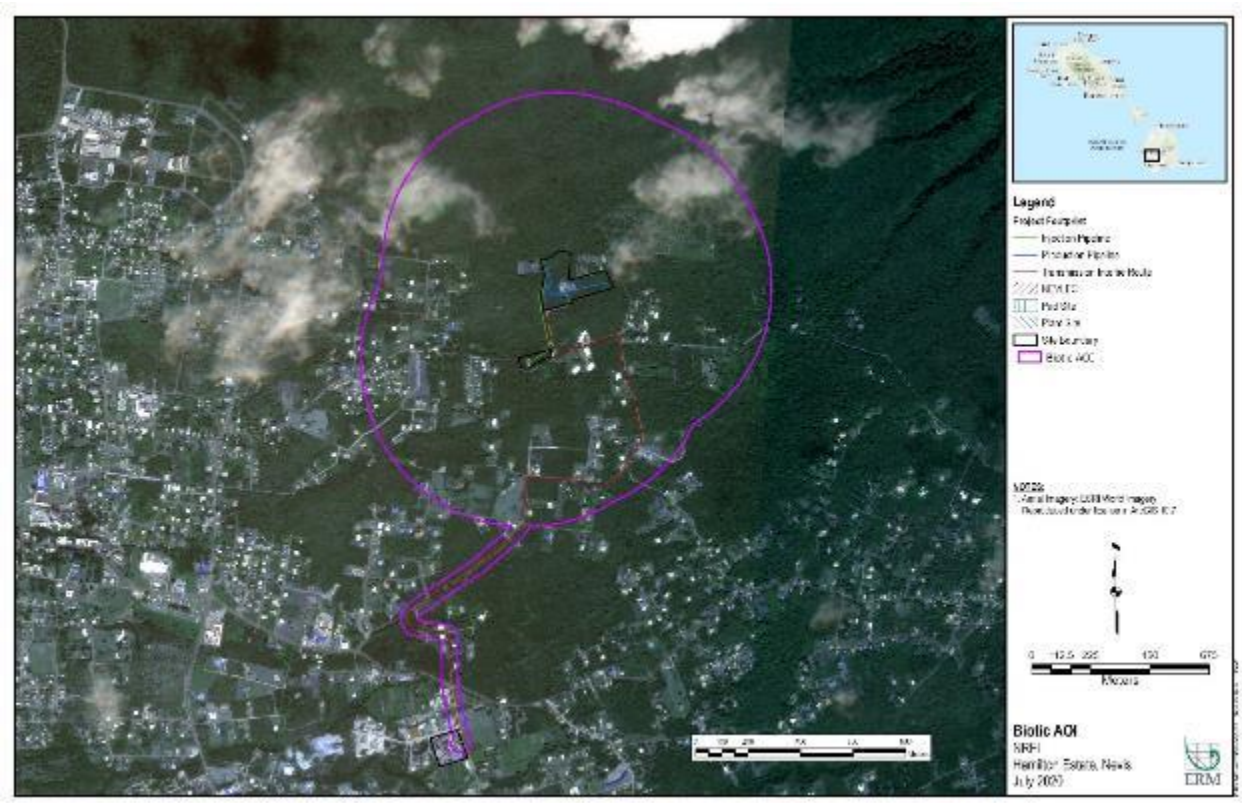
- Hamilton Estates:
  - 250 kcmil Al 33 kV cable, 3 km (single circuit, direct buried)
  - Substation at Geothermal Plant
  - 11/33 kV, 15 MVA transformer at Geothermal plant
  - 11/12.47 kV, 15 MVA transformer at Prospect Power Plant, and a
  - 11 kV Switchboard at Prospect Power Plant

5. DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 Areas of Influence

5.1.1 Environmental Areas of Influence

The Biotic Area of Influence (BAOI) includes the Project Area and an the surrounding area that has the potential to be impacted by noise and light from the proposed plant site, production wells, injection well, pipelines and underground transmission interline, which connects to the electrical power grid (refer to Figure 5-1.). According to P. Bayer *et al* (2013) and the IFC EHS guidelines for Geothermal Power Generation, noise due to drilling and steam venting activities may reach up to a maximum level of 100-120 dBA. The BAOI includes a 600 m distance from the potential Project noise sources that have a potential of maximum 100 dBA to meet IFC EHS Guidelines for residential areas of 45 dBA nighttime. The total BAOI is an area of approximately 203 ha. Unlike humans, there are no standardized noise limits for fauna.



Source: ERM, 2020

Figure 5-1. Biotic Area of Influence (BAOI)

5.1.2 Social Areas of Influence

The sections below provide information on the socio-economic profile of the island of Nevis as a whole, setting the stage for a good understanding of the Project's Area of Direct Influence (ADI). The ADI includes the Project footprint (Project parcel, transmission line routes, substation); the Long Point port, which the Project will use for cargo, with the transportation routes from the Project to the port; and the city of Charlestown, where Project traffic and waste management will have an impact. The ADI is considered as the area that could be directly impacted; however, the Project would also have implications for employment,

the economy, planning, and service provision in the whole of the island of Nevis. Therefore, the entire island of Nevis will be considered the Area of Indirect Influence (AII).

The images below show the location of the Project Footprint. It is located on parcels that are not occupied for residential purposes (EIA, 2017).

2020

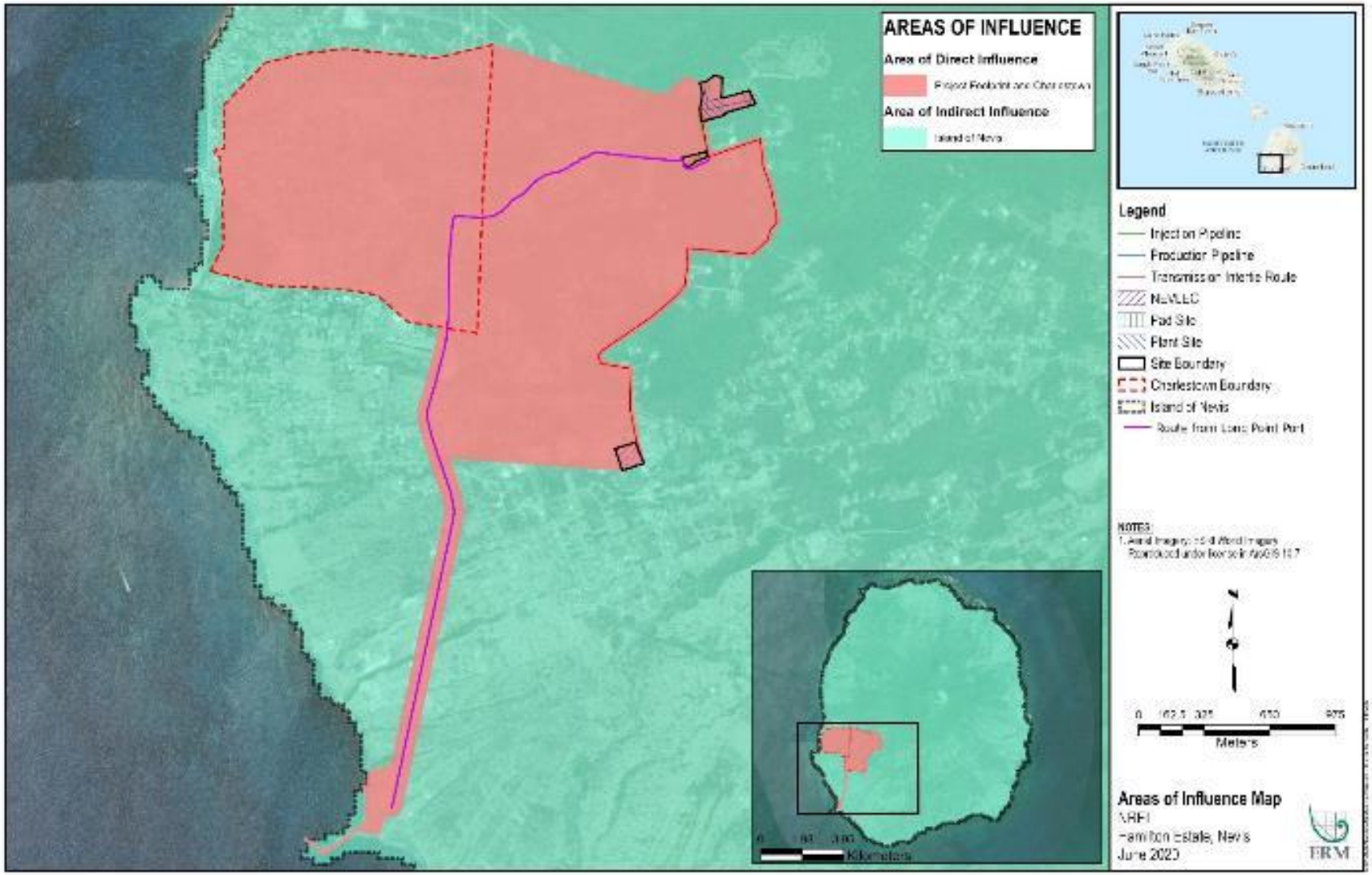
2017

Source: ERM, 2020

Figure 5-2. Land Use in ADI

The power plant and production wells will be in a former sugar cane field, and the injection well is on an unused storage site near the abandoned sugar works. Isolated residential clusters are within 0.5 miles of the proposed Hamilton Heritage Trust and Hamilton Stables parcels where the proposed binary power plant, production wells and injection well would be located. Further, Long Point Port is located in an industrial area (see Section 5.4.3.5).

The following Figure shows the geographical location of the ADI.



Source: ERM, 2020

Figure 5-3. Project ADI

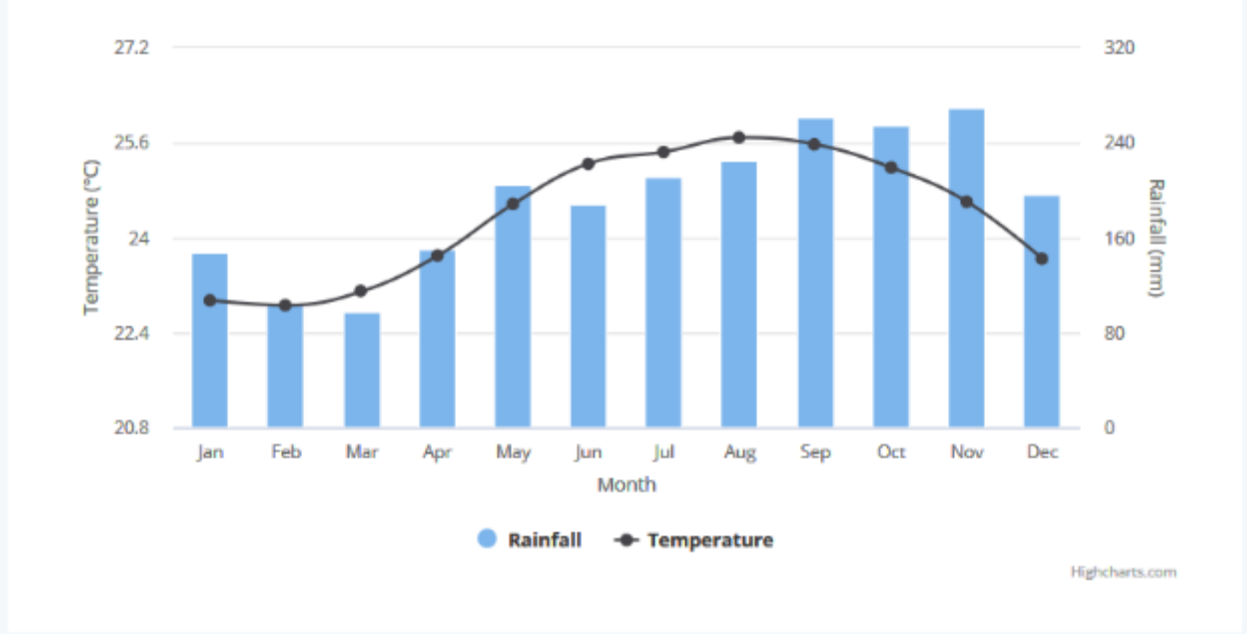
5.2 Physical Resources Baseline

5.2.1 Climate and Meteorology

The 2017 EIA prepared for the Nevis Binary Geothermal Development Project, Section 4.4.1 *Existing Climate and Air Quality Conditions* provides a description of the climatic conditions on the island of Nevis in general, and near the Project Site, based on 2003-2005 temperature and wind speed data. This section provides a summary of the climatic conditions in Nevis and updates temperature and wind speed data by including data from 2005 to 2020.

The island of Nevis has a tropical maritime climate, with a relatively cool, dry season from January to mid-April and a hot, humid, and rainy season from mid-June to mid-November. During the dry season, northeast trade winds blow steadily with moderate intensity. During the rainy season, the trade winds are more irregular. The island has a mean temperature of 27 degrees Celsius (°C) with only small diurnal and seasonal variations. Generally, rainfall is unevenly distributed between years and between months, but there is a reliable wet period from September to November and a dry period from January to April.

Rainfall amounts to approximately 1,200 millimeters (mm) per year along the coastline. Rainfall during the rainiest period, July to November, generally produces at least 102 mm of rain per month. Rainfall during the driest period, February to March, generally produces 100 mm per month. The average annual rainfall is approximately 1270 to 1778 mm during the rainy season. Rainfall events on the island are typically irregular and occur primarily in the form of downpours or thunderstorms. Humidity is generally about 70 percent. Figure 5-4. depicts SKN's monthly average temperature and rainfall from 1901 to 2016 (World Bank Group, 2020).



Source: World Bank Group, 2020.

Figure 5-4. Average Monthly Temperature and Rainfall Amounts for Saint Kitts and Nevis, 1901-2016

The Project Site does not have a weather station installed. The closest weather station is located at the Vance W. Amory (VWA) Nevis Airport, approximately 7 kilometers (km) north of the Project Site. The VWA weather station has been collecting daily and monthly temperatures and monthly wind speed data during

airport operations (typically 7 a.m. to 7 p.m.), at an elevation of approximately nine meters since 2000. The airport is at the northern tip of the island and it is not affected by island terrain. Figure 5-5. shows the average monthly temperature and wind speed from 2005 through 2020 collected at the VWA airport. The data shows that the temperature at the airport is relatively consistent and ranges only from approximately 26 to 28 °C. The highest temperatures occur during the months of June to October, and the lowest between December to February. Seasonal and diurnal variations in temperature are small. Mean temperature in summer months is around 26 to 27ºC, dropping by only a few degrees to 24 to 25ºC in the cooler months of December to February.

The airport data shows relatively strong and consistent trade winds with an average wind speed of approximately 21 kilometers per hour from the east-southeast (see Figure 5-5.). The airport location is not affected by the steep terrain of Nevis Peak or Round Hill.

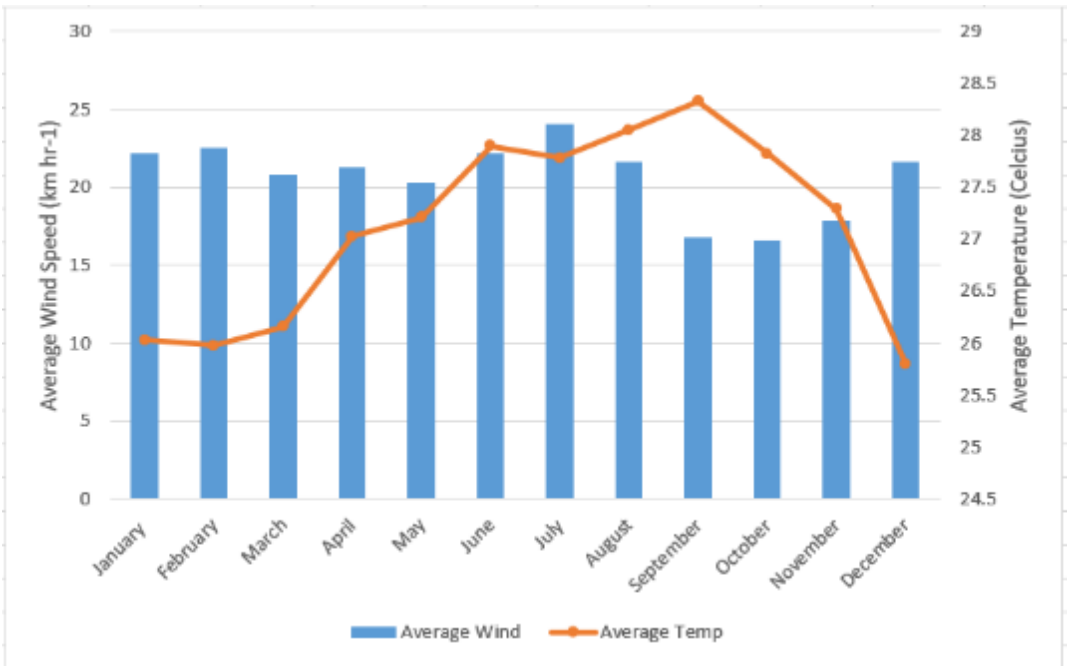


Figure 5-5. Average Monthly Temperature and Wind Speed – Vance W. Amory Airport, 2005-2020

Severe weather events in Nevis include high winds, floods, and storm surges associated with tropical rainstorms and hurricanes that occur during the rainy season. Hurricanes and storms are most likely to occur in the months of August to October, with hurricane season lasting from June to November (see Section 5.2.7, Natural Hazards, for more details).

5.2.2 Air Quality

Air quality data for Nevis is limited; in addition, there is no specific data available for the Project Site. In the Caribbean, seasonal variations in pollution can exist, with higher levels of air pollution in the dry season

(December to May) due to oceanic trade wind patterns and Saharan dust blowing in from Africa.[6] Air quality in the Caribbean can also be negatively affected by the use of biomass (e.g., wood) for home-heating, vehicle emissions, and waste burning. On Nevis, only green waste is burnt by the waste management authorities. WHO states that less than 5 percent (%) of households engage in solid fuel use.[7] In fact, 1% uses coal, 1.5% uses wood, 92.6% uses gas or cooking gas, 0.9% uses kerosene, 2.5% uses electricity and 1.5% use other sources.[8] Currently, vehicles are the greatest source of air pollution.[9] Key transport-related air quality challenges include the fact that the number of units of used vehicles in the country is increasing year by year. In 2013, 168 used vehicles were imported, which increased to 436 units in 2014.[10]

Further, the mean urban PM10 (particles with a diameter of 10 micrometers or less, which are inhalable into the lungs and can induce adverse health effects) in SKN, based on WHO country health statistics from 2004, is 33 micrograms per cubic meter (μg/m^3).[11] For reference, the United States' Environmental Protection Agency (EPA) establishes that PM10 must not exceed 150 μg/m^3 more than once per year on average over 3 years.[12] With regard to PM2.5 (particles with a diameter of 2.5 micrometers or less), WHO provides the mean annual concentration of fine suspended particles of less than 2.5 μg/m^3, which is another common measure of air pollution. The mean is a population-weighted average for urban population in a country. For SKN, it was 12.3 μg/m^3 in 2016.[13] The EPA recommends that PM2.5 must not exceed 12.0 μg/m^3 as a primary standard (standard that provides public health protection, and includes protecting the health of sensitive populations such as asthmatics, children and the elderly) as an annual mean, averaged over three years. The EPA also recommends that PM2.5 must not exceed 15.0 μg/m^3 in the 98th percentile, averaged over three years, as a secondary standard (standard that provides public welfare protection, protecting against decreased visibility and damage to animals, vegetation and buildings). Lastly, the EPA establishes PM2.5 is not to exceed 150 μg/m^3 during a period of 24 hours more than once per year on average over three years, for both primary and secondary standards.

It can be presumed that the ambient air quality in the Project Site and its vicinity is good because the area is generally undeveloped and corresponds to forest areas. There is high air dispersion, because the island is influenced by steady northeast trade winds and tropical oceanic and cyclonic movements. Besides the air emissions generated by the island's electrical power plant, there are no major industrial sources of emissions in Nevis and the area surrounding the Project Site is relatively undeveloped. Few vehicles access the Project Site or its vicinity.

According to the Initial National Communication on Climate Change, Nevis is considered a net sink (i.e., has negative contributions to global CO_2) for greenhouse gases (UNDP, 2020).

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[6] International Association for Medical Assistance for Travelers, St Kitts and Nevis, accessed at https://www.iamat.org/country/saint-kitts-and-nevis/risk/air-pollution#

[7] WHO Country Profile of Environmental Burden of Disease, 2004. Accessed at https://www.who.int/quantifying_ehimpacts/national/countryprofile/saintkittsandnevis.pdf?ua=1

[8] UN Environment Air Quality Policies for St. Kitts and Nevis, accessed at https://wedocs.unep.org/bitstream/handle/20.500.11822/17091/SaintKitts_Nevis.pdf?sequence=1&amp%3BisAllowed=

[9] UN Environment Air Quality Policies for St. Kitts and Nevis, accessed at https://wedocs.unep.org/bitstream/handle/20.500.11822/17091/SaintKitts_Nevis.pdf?sequence=1&amp%3BisAllowed=

[10] UN Environment Air Quality Policies for St. Kitts and Nevis, accessed at https://wedocs.unep.org/bitstream/handle/20.500.11822/17091/SaintKitts_Nevis.pdf?sequence=1&amp%3BisAllowed=, citing https://jctjapan.wordpress.com/saint-kitts-and-nevis-used-car-market/

[11] WHO Country Profile of Environmental Burden of Disease, 2004. Accessed at https://www.who.int/quantifying_ehimpacts/national/countryprofile/saintkittsandnevis.pdf?ua=1

[12] EPA Criteria for Air Pollutants, accessed at https://www.epa.gov/criteria-air-pollutants/naaqs-table

[13] WHO Global Health Repository Data, accessed at https://apps.who.int/gho/data/node.main.152?lang=en

5.2.3 Noise

The 2017 EIA and the 2020 Addendum to the EIA prepared for the Nevis Binary Geothermal Development Project provide a description of the existing baseline noise conditions within and near the Project Site.

As described in Chapter 4 *Project Description*, the proposed Project would be located primarily on two parcels of land at the Hamilton Estate, a former sugar cane plantation located on the western side of the island of Nevis (see Figure 4-1 *Project Description*). The two parcels are approximately 2.4 km east of Charlestown. The area surrounding the parcels contains the remains of the Hamilton Estate sugar works and individual residences or residential areas (closest noise receptors), which are located to the east, south and west of the Project Site.

In general, existing sources of noise at the Hamilton Estate correspond mainly to a rural settlement environment with a low volume of local traffic flow. The Hamilton Estate presents no industrial noise generating sources. Therefore, existing ambient noise levels in the vicinity of the Hamilton Estate are presumed to be low and within the International Finance Corporation (IFC) General Environmental, Health, and Safety (EHS) Guidelines (IFC, 2007) recommended noise level thresholds for residential areas. Existing ambient sound levels were not collected; however, based on the surrounding land use type of rural residential, we estimate that daytime sound levels are approximately 40 decibels (dB), and nighttime sound levels are approximately 34 dB (ANSI, 2013).

In addition, the Addendum report also provides the results of a predicted noise level modeling analysis conducted at the site that assessed the noise impacts of the proposed Project development to nearby noise receptors. The results of this assessment suggest that well drilling activities could result noise levels of up to 73 A-weighted decibels (dBA) at nearby residential receptors, which would exceed the IFC's daytime noise guidelines of 55 dBA equivalent sound level (L_{eq}) and the nighttime noise guidelines of 45 dBA L_{eq} if not mitigated. Well drilling and testing activities would last for more than 80 days for the eastern well pad, closest to two of the noise receptors, and an additional 40 days for maximum impacts from drilling of the injection well, which would have the greatest impact on three noise receptors. NREI has committed to installing an earthen berm or other temporary sound barrier to reduce drilling noise; however, the potential exists that IFC daytime and nighttime noise guidelines would be temporarily exceeding during the drilling activities even with the additional noise mitigation measures.

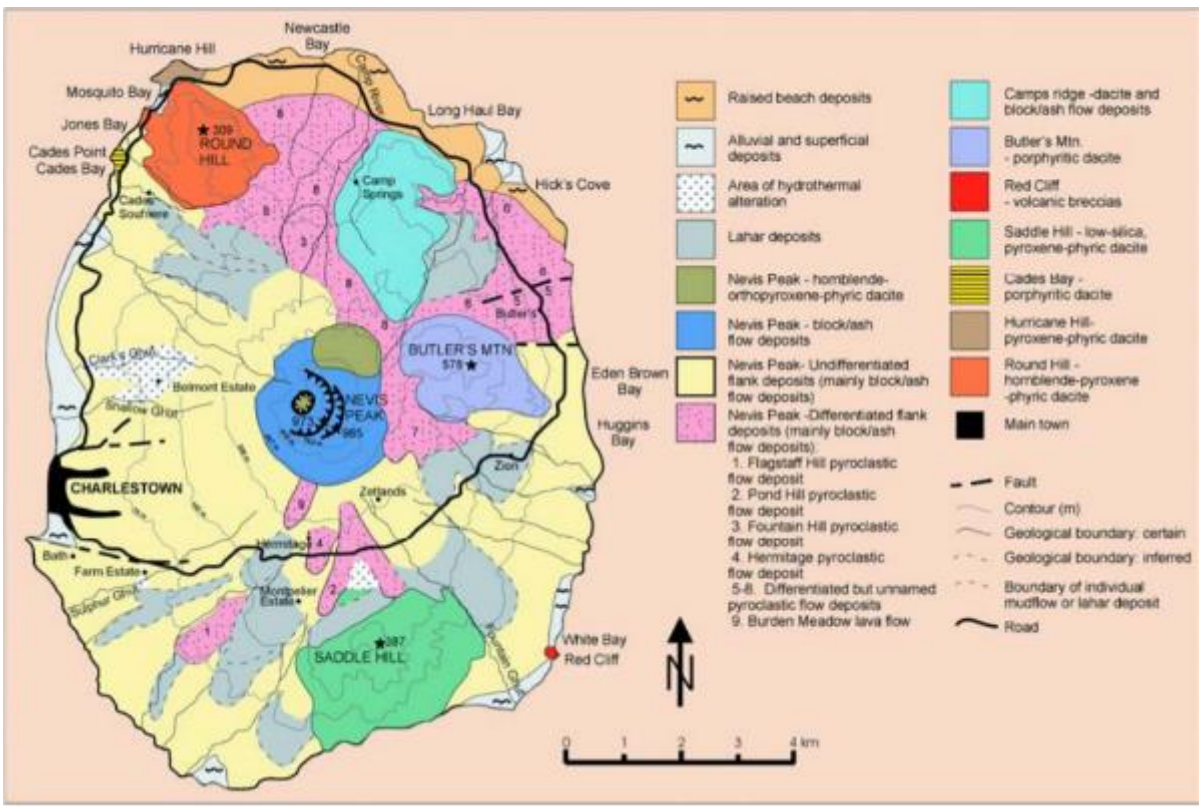
The noise modeling also assessed noise impacts at nearby noise receptors associated with operation of the facility's turbines and cooling system. To minimize the nighttime noise generation, some of the fans in the air-cooled condensers closest to the nearby residential receptors would be shut down. The results of the operational noise assessment show that the daytime noise levels would be below the IFC daytime noise guideline of 55 dBA L_{eq} at all nearby noise receptors, with the highest noise generated from facility operation at a nearby noise receptor being approximately 52 dBA L_{eq}. However, nighttime noise levels may exceed IFC nighttime noise guideline of 45 dBA L_{eq} at one noise receptor; the predicted nighttime noise at this receptor is approximately 48 dBA L_{eq}. Based on the noise assessment, additional noise mitigation could be provided by maintaining or planting vegetative buffers between the noise sources and the noise receptors.

IFC guidelines also recommend that noise impacts associated with a new facility should not result in an increase of background sound levels of greater than 3 dB at the nearest noise receptor. Based on the estimated background daytime sound level of 40 dB and nighttime sound level of 34 dB, the facility would result in daytime sound level increases ranging from approximately 4 dB to 12 dB, and nighttime sound level increases ranging from approximately 1 dB to 14 dB. Therefore, the facility has the potential to increase background sound levels more than 3 dB. However, with additional vegetative buffers, these increases could be decreased to at or near the IFC guidelines.

NREI has committed to maintaining existing vegetative buffers and/or planting additional vegetation to provide noise shielding to nearby noise receptors.

5.2.4 Geology, Geomorphology, and Topography

The island of Nevis is characterized by its volcanism and the subsequent weathering and erosion of volcanogenic rocks. Although Nevis is made up primarily of volcanic material, the oldest outcropping rock on the island is a conglomerate containing blocks of crystallized limestone that contain fossils of mid-Eocene age. Seven volcanic centers have been identified on Nevis: Hurricane Hill, Round Hill, Cades Bay, Saddle Hill, Red Cliff, Butler's Mountain, and Nevis Peak (University of West Indies, 2020). On the southern slopes of Saddle Hill, an outcrop of conglomerate yields blocks of recrystallized limestone — oldest rock type on the island. The next oldest rocks are volcanic, and much younger, being erupted during the Pliocene time. The oldest volcanic rocks crop out on the northwestern coast, while the youngest form Nevis Peak. Saddle Hill to the south is of intermediate age (UNDP, 2020). The Project Site is located on the west side of the Nevis, on undifferentiated pyroclastic deposits associated with past Nevis Peak eruptions (see Figure 5-6. Geological Map of Nevis). In addition, the west side Nevis, where the Project Site is located, also presents numerous surface features that indicate widespread geothermal activity and surface manifestations resulting from the geothermal heat and hydrothermal discharge (GeothermEx, 2019).



Source: Hutton and Nockolds, 1978.

Figure 5-6. Geological Map of Nevis

Nevis is a 93-square kilometer (km^2) island approximately oblong in shape dominated by the central Nevis Peak, 985 meters (m) high. The Nevis Peak, in the center of a chain of mountains, is the highest point on the island. Its rugged, heavily forested slopes rise gently from the sea. Windy Hill (309 m) and Saddle Hill (381 m) at the head and tail of the island, respectively, align with Nevis Peak to form a north-

northwest/south-south-east trending spine comparable to the more pronounced spine of St. Kitts. To the east, the spine is thickened by the bulge of Butlers Mountain (478 m). Slopes vary from almost zero near the sea, to over 40% in the vicinity of Saddle Hill, Butlers Mountain, Nevis Peak and Windy Hill (see Figure 5-7. Elevation Map of Nevis). Figure 5-8. depicts the elevation contours of the Project Site. In general, the site is relatively flat with slopes that range from 8 to 23%.

The eastern shoreline of Nevis is subject to the much higher wave energy environment from the open Atlantic to the east and consists of steep cliffs with gravel or no beaches. The western shoreline, protected by the Island Arc and subject to the less energetic wave environment from the Caribbean Sea, enjoys gentler slopes and extensive sand beaches. Some minor reef buildups are found offshore Nevis. The northeastern shore of the island has elevated beach deposits found far island. Such deposits are not observed anywhere else on the island and reach an altitude of approximately 18 to 21 meters above present mean sea level (Thermal, 2019).

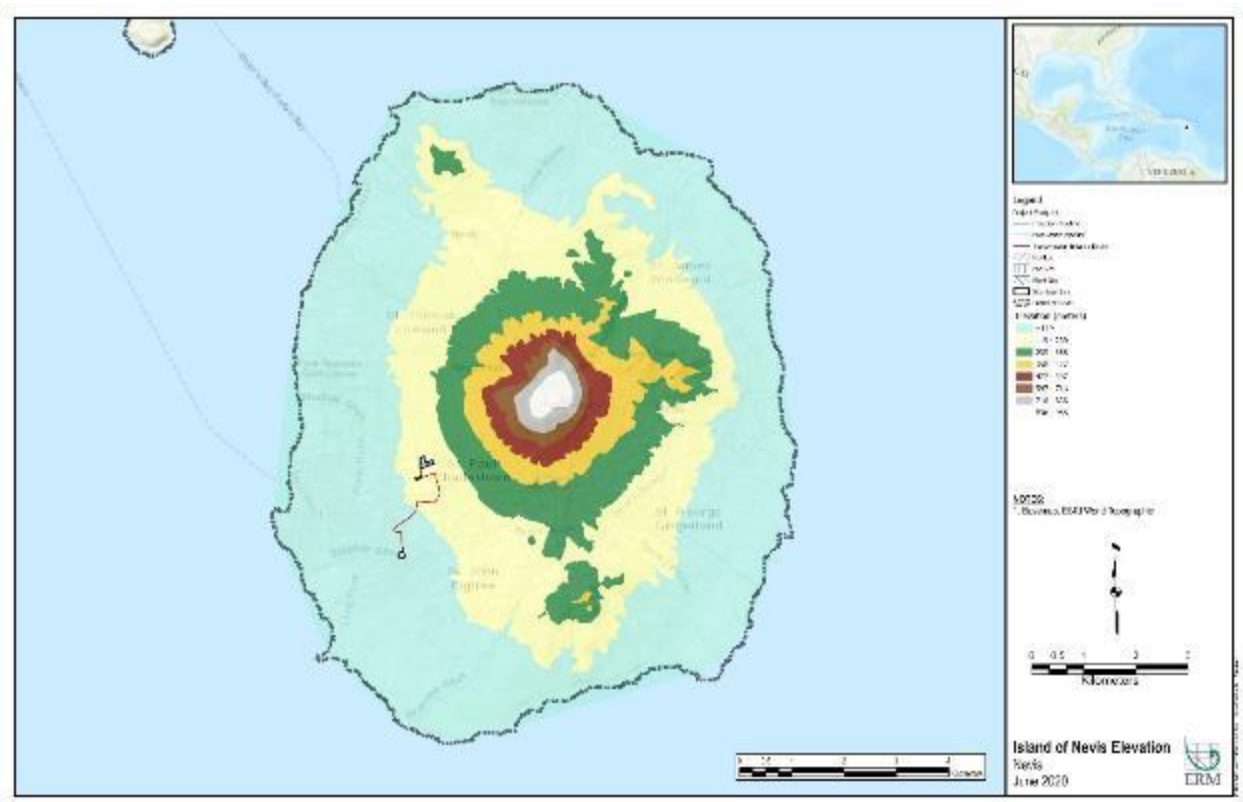


Figure 5-7. Elevation Map of Nevis

Figure 5-8. Elevation Contours Map of the Project Site

5.2.5 Soils

As described in the 2017 EIA prepared for the Nevis Binary Geothermal Development Project, available soil information for the island of Nevis is limited. In general, there are three primary landscape-soil type areas in Nevis:

- Soils on Nevis Peak, which are mature, but strongly acidic and unsuitable for agriculture;
- Soils that encircle the peak that varied in texture and are suitable for agriculture, but contain many boulders that limit mechanized agriculture methods; and
- Soils of low-laying areas that developed from volcanic sediments that are loamy and clayey soils.

As indicated in the Hamilton Estate Feasibility Report for the Nevis Geothermal Project (Thermal, 2019), the Project Site is not expected to encounter unconsolidated soils that could lead to ground failure. The main the soil types found at the Project Site include Rawlings gravelly loam and Charlestown clay loams (see Appendix B of the 2017 EIA for details).

5.2.6 Water Resources

The 2017 EIA prepared for Nevis Binary Geothermal Development Project provides a description of the existing conditions of the water and geothermal resources located within and close to Project Site.

Nevis's water needs for domestic, industrial and agricultural purposes are met by rainfall (see Section 5.2.1*Climate*), surface water, and groundwater sources. Groundwater accounts for 80% of the public piped supply and surface water accounts for the remaining 20% (USACE, 2004a). Annual average surface water resources are estimated at 3.6 million cubic meters (m^3) and groundwater resources at 20 million m^3.

Considering no overlap between surface water and groundwater resources, the total renewable water resources are estimated at approximately 24 million m^3 (see Table 5-1: FAO, 2015).

Table 5-1. Renewable Water Resources in Nevis

Renewable Water Resources	Year	Water Resource
Precipitation (long-term average)	—	1427 mm/year 371 million m^3/year
Internal renewable water resources (long-term average)	—	24 million m^3/year
Total renewable water resources		24 million m^3/year
Dependency ratio	—	0 %
Total renewable resources per inhabitant	2013	444 m^3/year
Total dam capacity	—	0 million m^3

Key:

mm/year = millimeter per year

m^3/year = cubic meters per year

m_3 = cubic meter

5.2.6.1 Surface Water

Nevis is divided into two hydrological basins: the Charlestown basin that encompasses the western half of the island and the Fountain basin that encompasses the eastern half of the island. All streams flow form Nevis Peak in response to heavy rains during the wet season, approximately July to November and discharge into the ocean (USACE, 2004b; see Figure 5-9. Surface Water Map). Water drains in a radial pattern from Nevis Peak through steep ghauts. The leeward side of the island contains numerous ghauts that create powerful rivers of rainwater that pour down after heavy rains. The ghauts are ephemeral and typically flow only three to four times a year, after major storms. The steep ghauts channel storm water runoffs toward the coast where coastal ponds, both freshwater and brackish, can reach capacity and spill over into the sea. Nevis also has non-potable volcanic hot springs, fumaroles, and other surface manifestations of the subsurface geothermal reservoir that rise through faults. For more details on water use, see Section 4.14 Surface Waters, subsection 4.14.1 Existing Conditions of the 2017 EIA.

Although the natural drainage patterns of the Project Site have been previously altered, Project development would fill two shallow ghauts and further alter existing drainage patterns, but would not impede drainage flows or otherwise increase the rate of off-site storm water flows (Thermal, 2019).

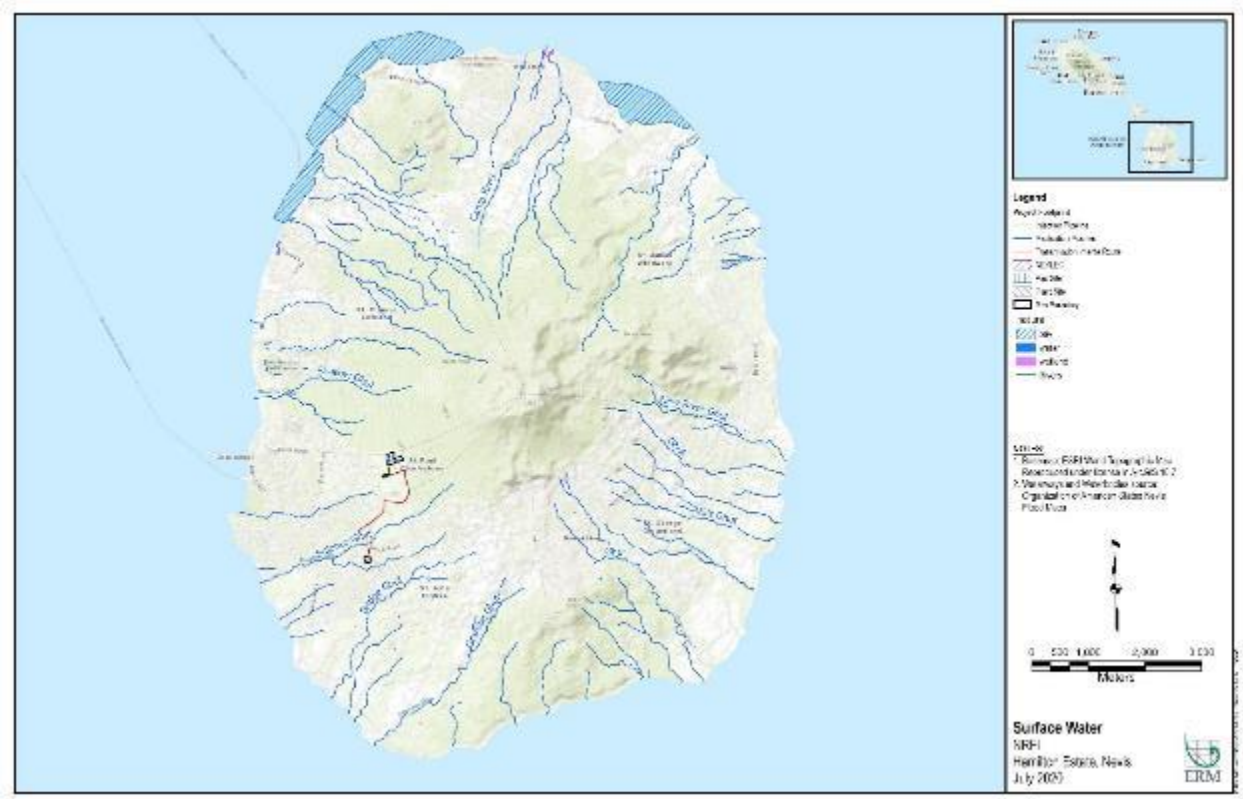


Figure 5-9. Surface Water Map

5.2.6.2 Groundwater

Groundwater resources in Nevis consist of freshwater and saltwater aquifers separated by an impermeable aquitard layer (GeothermEX, 2005). The freshwater aquifer water table rises toward the center of the island, which reflects the high rate of precipitation on the steep slopes of the Nevis Peak (see Figure 5-10. Groundwater Map. The lower boundary of the freshwater aquifer extends below the peak in a triangular form with a boundary separating it from the saltwater lens.

Recharge of the groundwater aquifer from infiltration is poor. Shallow clay soils, underlain by a silica pan, cover approximately 75 percent of Nevis, severely limiting infiltration. In addition, rapid runoff through the ghauts and exposure to evaporation reduces the amount of groundwater recharge. As the ghauts approach the coast, the slopes decrease, but not enough to allow for substantial recharge. The estimated safe yield is approximately 38 million litres or 38 000 m^3 per day. This figure, however, is now under discussion since the groundwater aquifers are being impacted on by sea level rise and will eventually be negatively impacted by saline intrusion due to climate change (FAO, 2015). For more details on groundwater and water use, see Section 4.14 Surface Waters, subsection 4.14.1 Existing Conditions of the 2017 EIA.

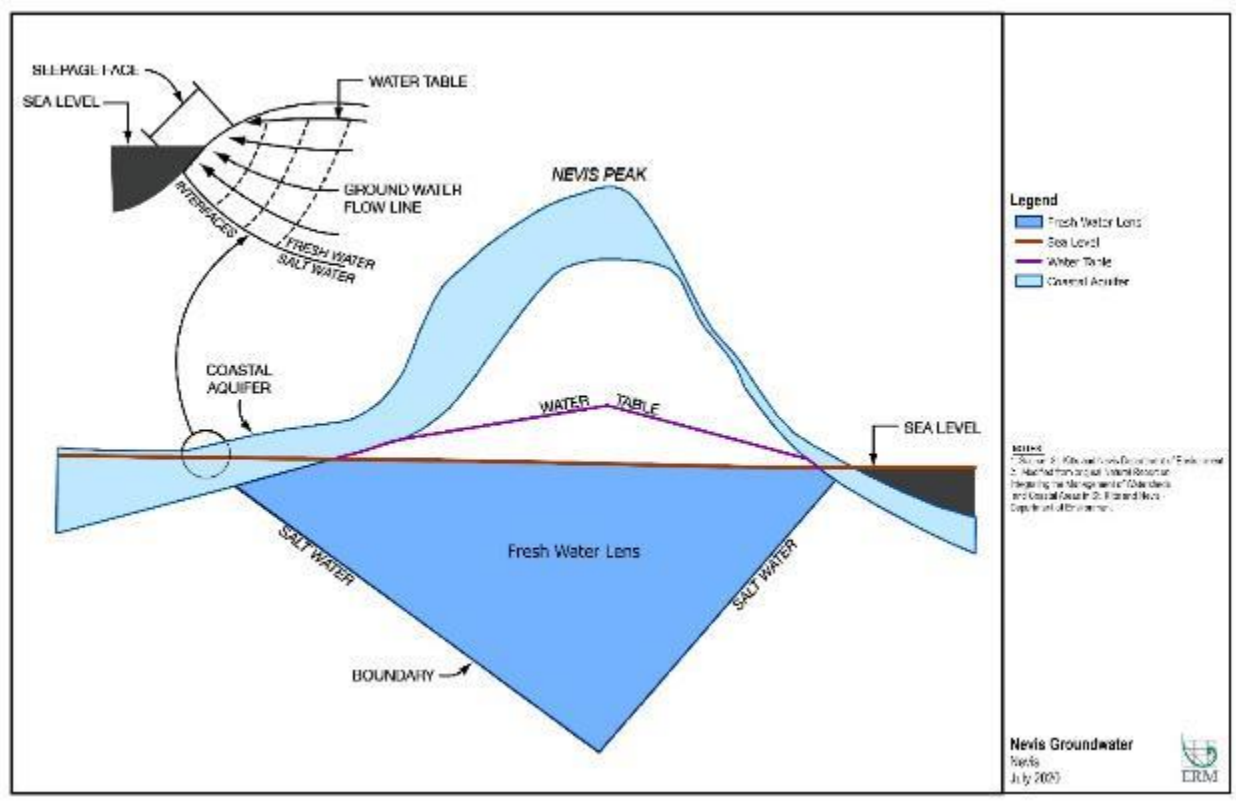


Figure 5-10. Groundwater Map

5.2.6.3 Geothermal

Nevis has long been identified as a known geothermal resource. Site investigations over the last three decades have included both regional and site-specific studies. Direct investigations of Nevis' resources have included a broad range of geophysical surveys, geochemical testing of wells, hot springs and fumaroles and installation and testing of exploration wells across the Island, with data showing that the local geothermal resource is several times that required to meet the power needs of Nevis and export to neighboring islands (TEP, 2019). According to Energy Transition Initiative, Saint Kitts and Nevis has 50MW – 300MW of geothermal potential (Energy Transition Initiative, Energy Snapshot for The Federation of St. Kitts and Nevis, 2015).

Further, in 2018, Nevis' geothermal resource was characterized as one of the top six geothermal reservoirs in the world. Nevis' geothermal resource was originally characterized through a Big-Data Analytics approach that estimated the resource to be commercial-grade quality by TEP. Those previous estimates were subsequently confirmed by a team from GeothermEx, a subsidiary of Schlumberger, during a Geothermal Flow & Injection Test.[14]

5.2.7 Natural Hazards

The primary natural hazards events that are expected to affect Nevis and have the potential to impact the Project Site include hurricanes and tropical storms, coastal flooding, volcanic eruptions, and earthquakes.

[14] Renewable Energy Caribbean, Nevis' geothermal resources are among the biggest in the world, 2018 accessed at https://renewableenergycaribbean.com/2018/04/03/nevis-geothermal-resources-are-among-the-biggest-in-the-world/

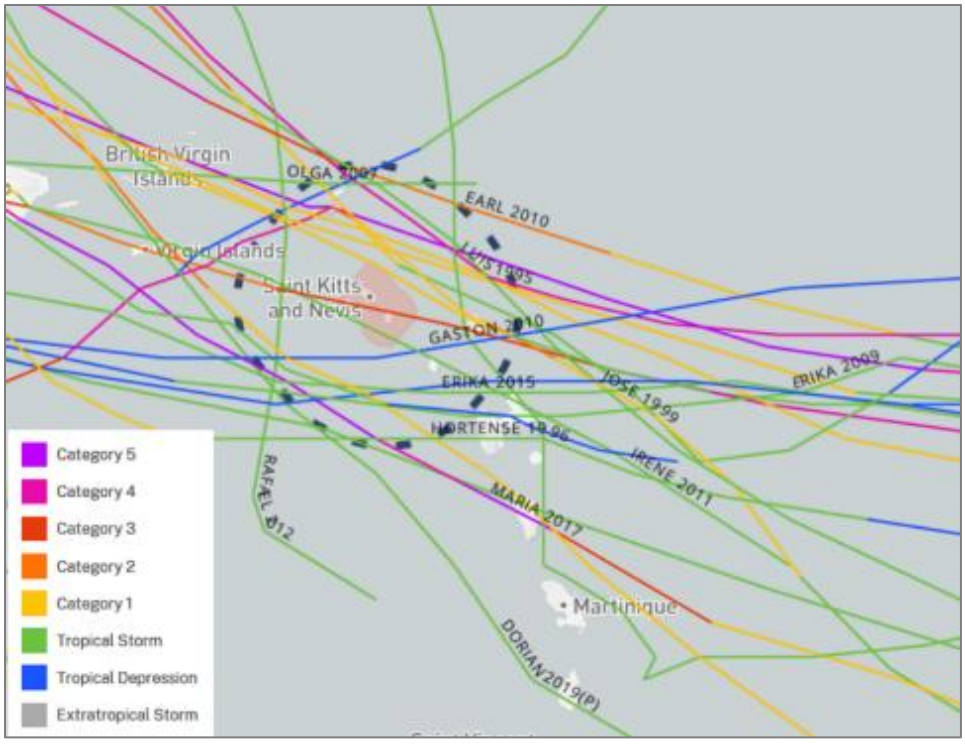
5.2.7.1 Hurricanes and Tropical Storms

The island of Nevis is located within the Atlantic Tropical Cyclone basin. This basin includes much of the North Atlantic, Caribbean Sea and the Gulf of Mexico. On average, six to eight tropical storms per year form within this basin. The formation of these storms, and possible intensification into mature hurricanes, takes place over warm tropical and subtropical waters. Eventual dissipation or modification of these storms occurs on average seven to eight days later, typically occurs over the colder waters of the North Atlantic, or when the storms move over land and away from the sustaining marine environment. The hurricane season extends approximately from June to November (USACE, 2004b).

According to ThinkHazard.org, a web-based tool developed by the Global Facility for Disaster Relocation and Recovery (GFDRR) in partnership with the World Bank Group and other institutions, and with data contributed by numerous organizations around the world, Nevis's risk of hurricane hazards is classified as *High* (ThinkHazard, 2020). This means that there is more than a 20 percent chance of potentially damaging wind speeds for projects developed in this area in the next 10 years. Based on this information, the impact of hurricanes must be considered in all phases of the Project, in particular during design and construction methods. Damages can also occur from hurricane-induced heavy rainfall and subsequent flooding as well as floods in coastal areas.

Due to the destructive nature of these storms, landfall can result in significant damage to upland development and facilities and the environment from wind and waves and storm surges. Twenty five tropical storms and hurricanes have passed within approximately 100 km of Saint Kitts and Nevis from 1995 through 2019 (see Figure 5-11.), as reported by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center.

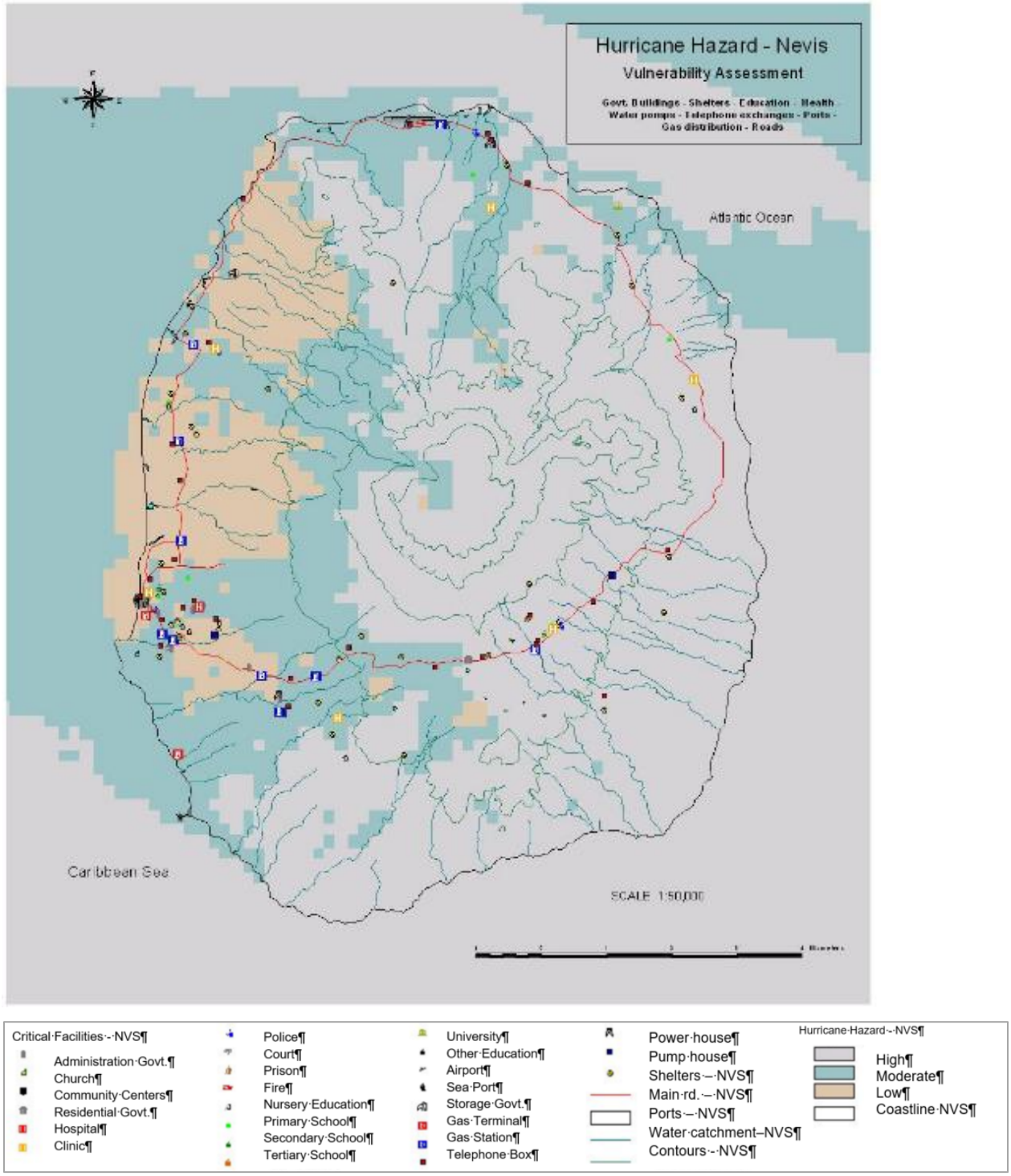
In Saint Kitts and Nevis, the maximum wind speed of hurricanes when they hit the islands has historically ranged from 75 to 175 miles per hour (mph) [121 to 282 kilometer per hour]. These speeds, according to the Saffir-Simpson Hurricane Wind Scale, represent Category 1 to Category 5 hurricanes. NOAA's National Hurricane Center describes the type of damages that may be caused by a Category 5 hurricane winds, which include: a high percentage of framed homes will be destroyed, with total roof failure and wall collapse; fallen trees and power poles will isolate residential areas; power outages will last for weeks to possibly months; and most of the area will be uninhabitable for weeks or months. Figure 5-12. shows hurricane vulnerability in the island of Nevis. The Project site is located in moderate vulnerability zone.



Source: ERM, 2020, adapted from: https://coast.noaa.gov/hurricanes/

Notes: Hurricane Category 1 = 19-153 km/h: Very dangerous winds will produce some damage; 2 =154-177 km/h: Extremely dangerous winds will cause extensive damage; 3= 178-208 km/h: Devastating damage will occur; 4 = 209-251 km/h: Catastrophic damage will occur; and 5 =252 km/h or higher; Catastrophic damage will occur.

Figure 5-11. Hurricanes and Tropical Storms within 100 kilometers of Saint Kitts and Nevis (1995-2019)

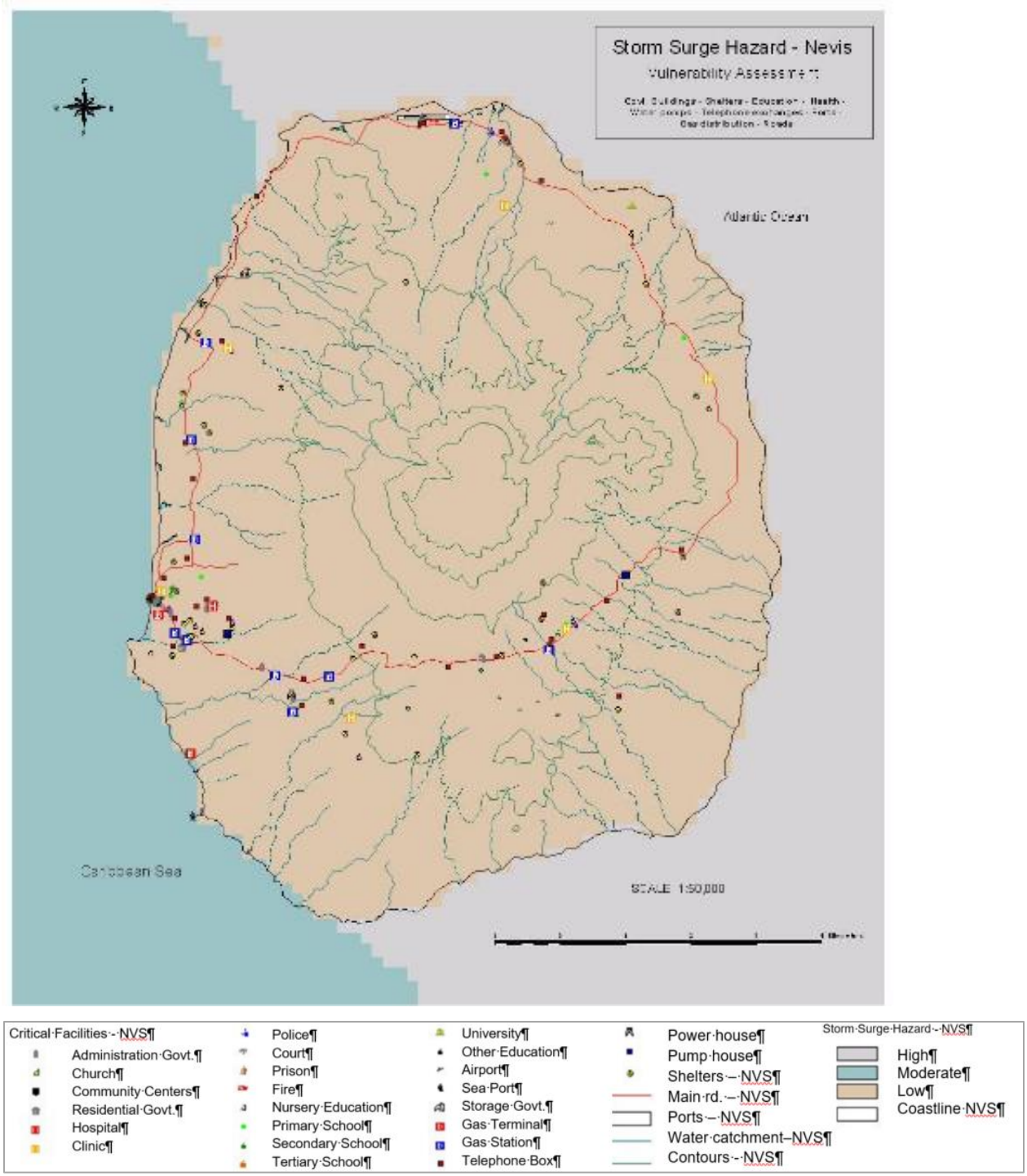


.Source: USAID/OAS, 2020.

Figure 5-12. Hurricane Vulnerability in the Island of Nevis

Both hurricanes and waves from the Caribbean and Atlantic Ocean combine with storm surge, generally during high tide, and generate extreme wave conditions. Flooding and erosion typically occur during these wave conditions. The waves erode protective beaches and cause surge and flood damage to the adjacent

lands, buildings, infrastructure, and groundwater resources. Figure 5-13. shows the expected long-term vulnerability of Nevis to storm surge. The Atlantic coast of the island has a moderate vulnerability and Caribbean coast has a low surge vulnerability.



Source: USAID/OAS, 2020.

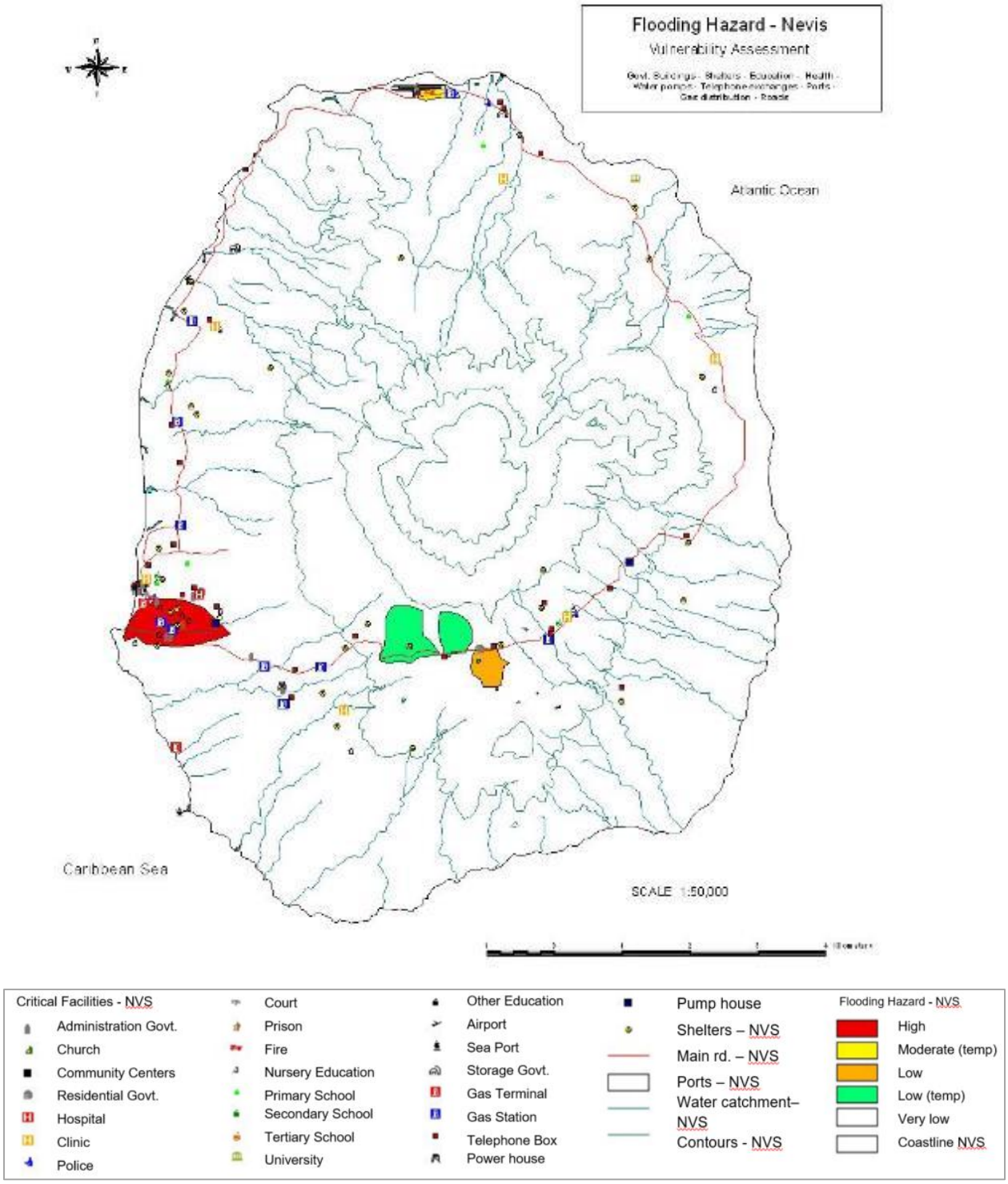
Figure 5-13. Nevis Long-Term Vulnerability to Storm Surge

5.2.7.2 Coastal Flooding

According to ThinkHazard.org, coastal flood hazard for Nevis is classified as *Medium*. Coastal flooding, together with hurricanes and tropical storms, are important natural hazards with disaster risks. Figure 5-14. Nevis Flood Hazard Map below shows hazard areas for flooding in Nevis. The Charlestown area shows a high vulnerability to floods along the Bath Ghaut area. A moderate flood vulnerability area exist at Newcastle airport. Additionally, three low vulnerability areas also exist in the Brown and Clay Ghaut Estates and Hermitage area. The Project site is located in an area with a very low vulnerability.

According to the US Army Corps of Engineers (USACE) Water Resources assessment (USACE, 2004a), the primary cause of flooding in Nevis is extreme rainfall associated with hurricanes and violent thunderstorms. The four main properties of Saint Kitts and Nevis that increase flooding, according to the USACE Water Resources Assessment, are:

- Soils that are highly erodible;
- Watersheds that are very steep;
- Urbanized foothills; and
- Livestock grazing on Nevis, which compacts soils and reduces infiltration rates.



Source: USAID/OAS, 2020.

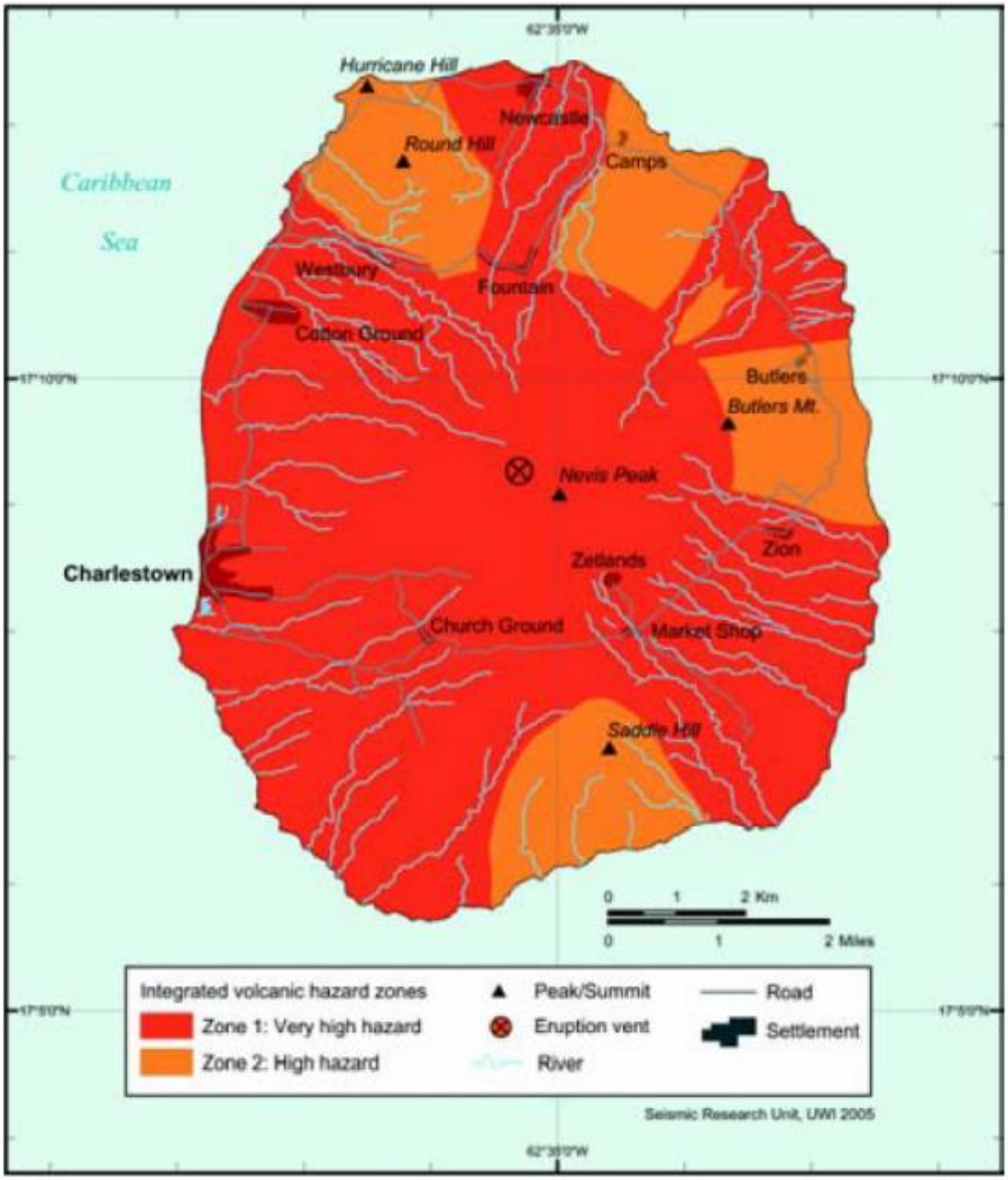
Figure 5-14. Nevis Flood Hazard Map

5.2.7.3 Volcanic Hazard

According to ThinkHazard.org, volcanic hazard for the island of Nevis is classified as *High*. This means that the selected area evaluated for volcanic hazard is located at less than 50 km from a volcano for which a potentially damaging eruption has been recorded. The Project site is approximately 2 km from the Mount Nevis (Nevis Peak) volcanic center. The Mount Nevis volcanic center is interpreted to have formed predominantly by effusive eruptions of lava that produced several nested lava domes and voluminous block and ash flow deposits during their evolution. The volcanic center is an active volcanic zone, where hot springs and fumaroles are active (the most recent of these formed in 1953 and remain active), and seismic swarms have occurred on several occasions. The peak is centrally located on the island at an elevation of approximately 984 m. Information relating to volcanic eruption history in Nevis is incomplete and unsubstantiated with attendant loss of property and life, but are noted in anecdotal accounts from 1642 and 1843. Both described perceived eruption activity (GFDRR, 2006).

Volcanic hazards associated with the Nevis volcanic center include dome-collapse pyroclastic flows and associated surges, airfall, and lahars. The most vulnerable areas would be the north and northwest parts of Nevis due to the topography of the breached crater, as the lava dome is confined on the south and southeast sides. Pyroclastic flows and surges would travel down the flanks of the volcano, initially confined to valleys and then spreading out onto gentle slopes towards the sea. Figure 5-15. shows the integrated volcanic hazard zones, indicating that the Project Site is located within Zone 1 (very high volcanic hazard).

Based on the information described above, the impact of volcanic eruption must be considered in all phases of the Project, in particular during project design, implementation and maintenance, and closure.



Source: ERM, 2020, adapted from: http://uwiseismic.com/Downloads/nevis4website.pdf

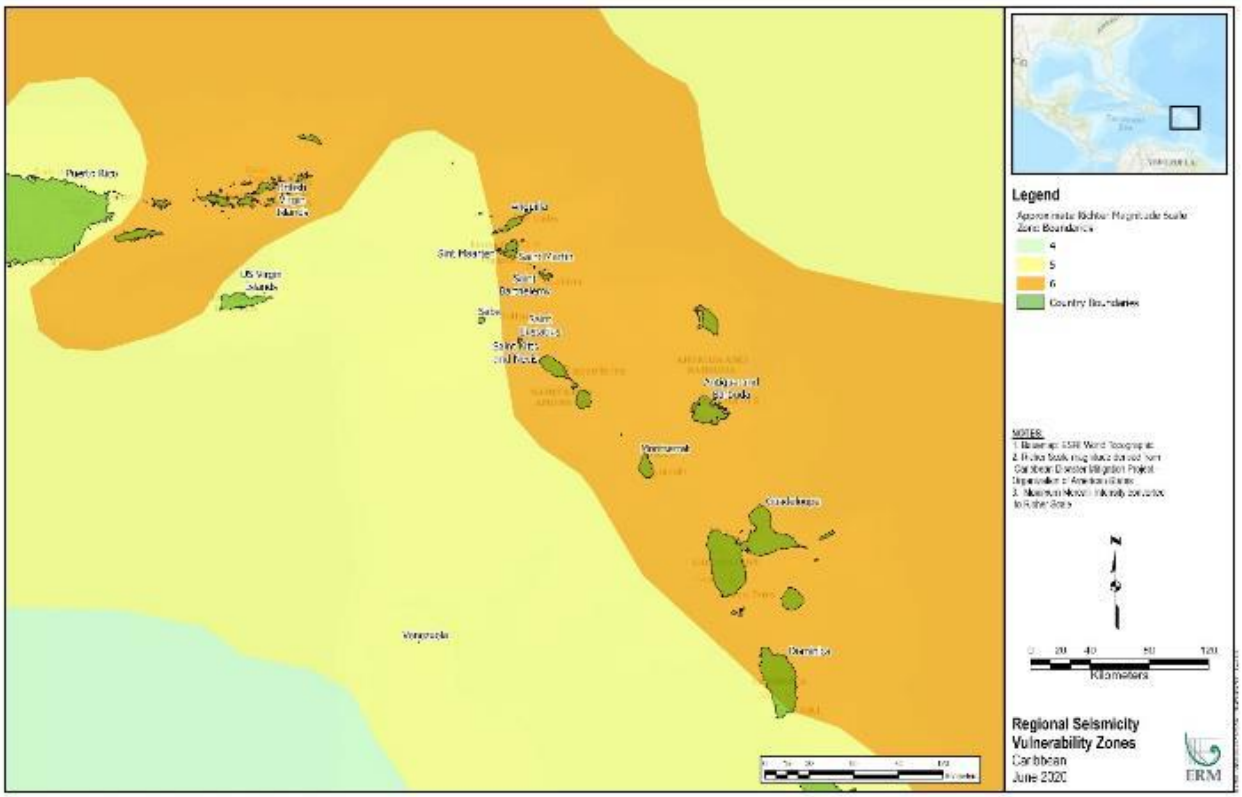
Figure 5-15. Volcanic Risk Zones in the Island of Nevis

5.2.7.4 Earthquake Hazard

According to ThinkHazard.org, Nevis's earthquake hazard is classified as *Medium*. This means that there is less than a 10 percent chance of a potentially damaging earthquake in the next 50 years.

Nevis is regularly exposed to low-level earthquake activity related to shallow origins associated directly to the tectonic interaction of the Caribbean and Atlantic tectonic plates and indirectly from volcanic activity associated these tectonic plates (St. Kitts and Nevis Initial National Communication, 1994). These low-level earthquakes are relatively shallow and originated at depths between 1-11 km (GFDRR, 2006). Large

earthquakes are uncommon but owing to the proximity of plate boundaries, they are a possibility for Nevis. In November of 2007, an earthquake of 7.3 magnitude in the Richter scale occurred off the coast of Martinique. Recently, according to the website earthquaketrack.com, there were four earthquakes felt in Nevis in 2020, the largest one being 4.3 magnitude in the Richter scale. None of these seismic events originated in the island of Nevis, originating in other areas of the Caribbean such as San Martin and Anguilla. However, even though seismic activity may often originate in the island of Nevis, earthquake or seismic activity vulnerability for Nevis is a Category 6 on the Richter Magnitude scale (Figure 5-16.).



Source: ERM, 2020

Figure 5-16. Regional Seismic Vulnerability Map

5.3 Biodiversity Baseline

This biodiversity baseline provides an overview of the terrestrial biodiversity of the Project Area (immediate area of the Project) and the Project Biotic Area of Influence. The Project Area is comprised of two parcels and an associated transmission line. The parcels include a 9.1 acre Hamilton Heritage Trust Parcel, where the power plant and production well pads will be located; the 1.2 acre Hamilton Stable Parcel, where the injection well will be located, injection pipeline; and a 2.8 km underground 33-kV transmission intertie line to the electrical grid. The Project Biotic Area of Influence (BAOI) is the area that encompasses the Project Area, extends outwardly, and covers approximately 203 hectares (ha).

5.3.1 Biological Setting

Nevis is a small, tropical island within the inner arc of the Leeward Islands in the chain of the West Indies in the Caribbean Sea. Nevis is located near the northern end of the Lesser Antilles and has a volcanic peak of approximately 985 m at its center with sandy beaches along the western and northern coasts. The slopes

of the volcano, diverse vegetation, and the surrounding ocean dominate Nevis' visual landscape. The Project Area lies on the western, lower flanks of Nevis Peak at elevations between 150 and 185 meters (500 and 610 feet, respectively) above sea level (masl).

In 1946, a Colonial of the Forest Service (J.S. Beard) surveyed Nevis and developed a classification system for the small island since he observed extensive secondary scrub woodlands and thornbushes admist cultivated acreage in the island's lowlands (Lindsay and Horwith, 1999). Beard further observed:

> Good high forest is only seen on the north-western face of the main mountain above Jessup's, where protection from the prevailing wind has enabled a good stand of rain forest to develop. At the head of the Stapleton River on the northeast there is also some high forest but it is somewhat ruinate. Elsewhere on the mountains the slopes are so steep and exposed that the belt of low secondary woodland adjoining cultivated lands at the foot is very quickly succeeded by palm brake which continues right up to the summit (Lindsay and Horwith, 1999).

According to the Beard system of classification, Nevis has six vegetation zones: rain forest, dry evergreen forest, montane thicket, palm brake, elfin woodland, and dry scrub woodland (Lindsay and Horwith, 1999; EIA 2017). The Project Area is relatively flat land contained within two parcels of approximately 10.3 acres of a former sugarcane plantation that currently comprised of low-lying scrub/shrub vegetation, located approximately 2.4 kilometers (1.6 miles) from Charlestown within the Saint Thomas Lowland Parish (Point Impact Analysis, EIA, 2017).

5.3.2 Terrestrial Biodiversity Survey Results

The EIA's for the Nevis Geothermal Development Project (Point Impact Analysis, 2010 & 2017) describe the terrestrial flora and fauna species that occur within the Project Area. In 2017, baseline field surveys were conducted within the 9.1 acre Hamilton Heritage Trust Parcel, where the power plant and production well pads will be located, and the 1.2 acre Hamilton Stable Parcel, where the injection well will be located.

ERM preformed a desktop analysis using the Integrated Biodiversity Assessment Tool (IBAT), Global Biodiversity Information Facility (GBIF), published literature and a published rapid terrestrial biodiversity assessment conducted in 2009 by the Organization of Eastern Caribbean States' (OECS) Environmental and Sustainable Development Unit to understand the potential for species to occur within the Biotic AOI. The 2009 OECS report consisted of field-based survey work conducted in 2009 that included mist-netting, incidental observations and encounters, targeted searches of habitats and specific sites/features (i.e., Nesting areas and roosts), from previous reports and records, and from expert knowledge and familiarity with the area.

The following sections summarizes the results of terrestrial flora and fauna species occurring within the immediate Project Area and those potentially occurring in the Biotic AOI. Aquatic habitats are not assessed in the EIA (Point Impact Analysis, EIA, 2017) and do not occur within the BAOI.

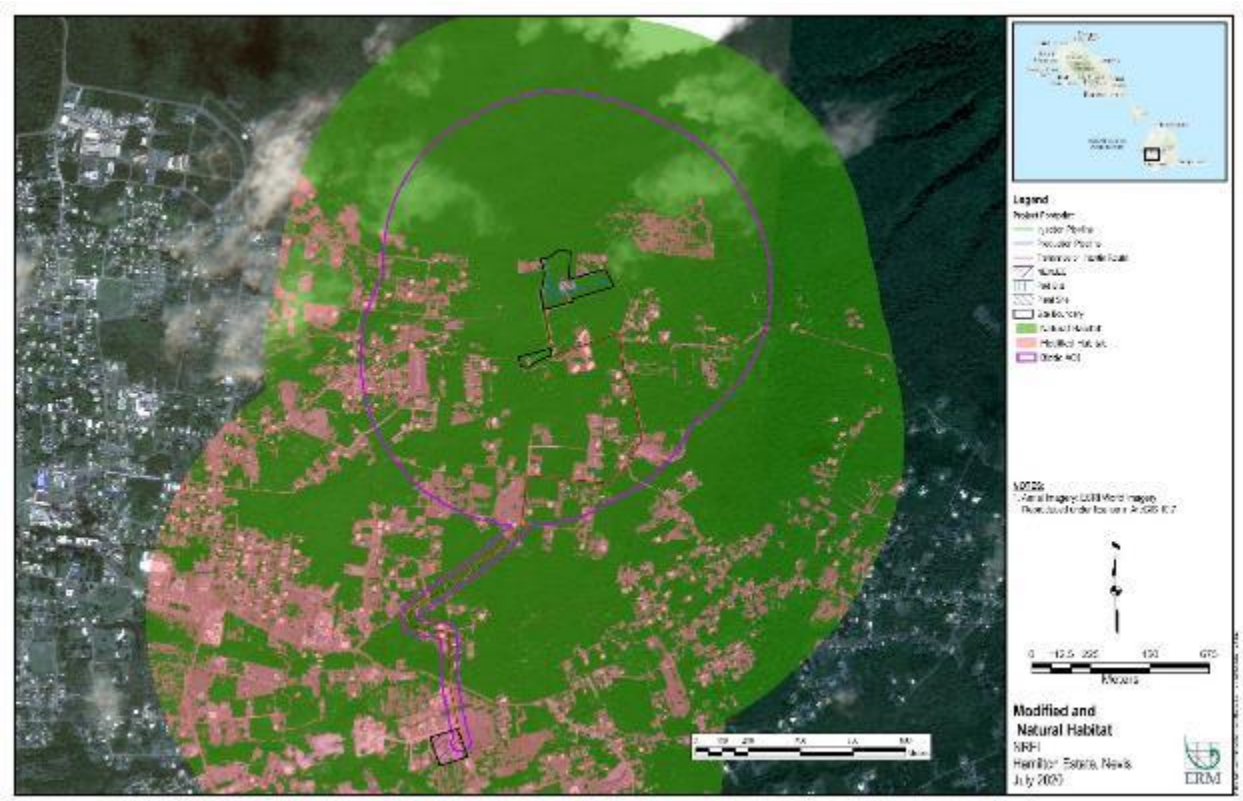
5.3.2.1 Vegetation Biodiversity

The proposed Project Area's parcels of land have a long history of agricultural use, including sugar cultivation until the 1950s. Following the cessation of sugar cultivation, a wide variety of products from cotton to vegetables was grown at the Hamilton Estate. The project parcels were also used for grazing of domesticated animals. Grazing and browsing by goats and wild donkeys, which has intensified over approximately the last 25 years, has affected regrowth at the sites and resulted in a higher proportion of toxic and spiny unpalatable species. Overall, the vegetation cover of the site is secondary growth with varying maturity. There are a few large trees, mainly located near the boundaries of the old estate roads, but generally, the canopy height is around 2.5 to 3.6 m (EIA, 2017, sec 4.3.1).

Nevis Island habitat is characterized by both modified and natural vegetation; however, the BAOI is comprised of 19% modified and 81% natural habitat (see Figure 5-17.**Error! Reference source not found.** and **Error! Reference source not found.**). Based on historical vegetation of the island, primary and s econdary forest vegetation is considered natural habitat.

Table 5-2. Summary of Natural and Modified Habitats in the BAOI

Habitat	Area (hectares)	Percentage
Modified	38.55	18.98 %
Natural	164.49	81.01 %
TOTAL	203.04	100 %



Source: ERM, 2020

Figure 5-17. Natural vs Modified Habitat in the BAOI

Natural Critical Habitat

Based on the desktop assessment conducted for this baseline**, it is unlikely that natural critical habitat occurs within the BAOI**. The natural habitat within the BAOI does not occur within an existing or proposed national or international protected area nor within an unprotected area of high conservation value, as much of area is regrowth vegetation from previously tilled land. Additionally, natural critical habitat was assessed

using criteria established by IFC (2012) and IDB (2006). The Criteria were evaluated using numerical thresholds defined in IFC PS 6 for the first four critical habitat criteria (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems), and scientific literature for criterion 5.

It is highly unlikely that thresholds for Criterion 1 are met within the BAOI, as the Black-capped Petrel (*Pterodroma hasitata*) is the only endangered species that possibly occurs nearby to the BAOI. However the species occurrence within the BAOI is highly unlikely, since it inhabits areas near steep cliffs above 1,000 meters and was not recorded within the immediate Project Area.

It is unlikely that Criteria 2 thresholds are met within the BAOI, as several Lesser Antillean Island endemics possibly occur in the BAOI, these species appear to be fairly common and wide ranging within their restricted habitat. The Lesser Antillean endemics include five reptiles, two bats, and five birds, of which are the Lesser Antillean Whistling Frog (*Eleutherodactylus johnstonei*), St. Christopher Ameiva (*Pholidoscelis erythrocephalus*), Statia Bank Tree Anole (*Anolis bimaculatus*), Island Least Gecko (*Sphaerodactylus sputator*), the Leeward Blindsnake (*Antillotyphlops geotomus*), Tree bat (Ardops nichollsi), Insular Single Leaf bat (*Monophyllus plethodon*), Green-throated Carib (*Eulampis holosericeus*), Antillean Crested Hummingbird (*Orthorhyncus cristatus*), Lesser Antillean Flycatcher (*Myiarchus oberi*), the Brown Trembler (*Cinclocerthia ruficauda*), and the Lesser Antillean Bullfinch (*Loxigilla noctis*). Of these species, the St. Christophers Ameiva, Statia Bank tree Anole, Island least Gecko, the Leeward Blindsnake, and the Tree bat are restricted range. However, the Lesser Antillean Bullfinch was the only species recorded within the baseline survey of the immediate Project Area, which appears to be common with over 18,000 occurrences in GBIF.

The BAOI does not trigger Criteria 3, as there are no migratory or congretory areas known within the BAOI. Nevis is an island stop over for many migrating birds flying north, however based on literature and baseline reports, migrants congregate along the shoreline, shoals, wetlands and along the high steep cliffs of Nevis, none of which occur with the BAOI.

In addition, **there are no reported highly threatened or unique ecosystem to trigger Criteria 4 nor spatial features associated with evolutionary processes to trigger Criteria 5.**

5.3.2.2 Flora Species

The following section summarizes the results of terrestrial flora species from the field survey in 2017 and ERM's IBAT assessment that are likely to occur within the Project Area and the BAOI.

Flora within the Direct Footprint

During the 2017 EIA baseline surveys, field personnel recorded 43 flora species within the Project Area (EIA 2017). These surveys were conducted within both the 9.1 acre Hamilton Heritage Trust Parcel and the 1.2 acre Hamilton Stable Parcel. During the field assessment, both parcels were comprised of dense, almost impenetrable thickets of grasses, various herbaceous plants, and entanglements of vines, sparsely vegetated secondary, pioneer species, and with an upper story of shrubs and trees.

The most common and abundant tree and shrub species include wild tamarind (*Leucaena leucocephala*) and Casha (*Acacia macracantha*). The most common vegetative grasses and herbaceous species include Indigo, such as Guatemalan indigo (*Indigofera suffruticosa*) and true indigo (*Indigo tinctoria*), and wild Jasmine (*Jasminum fluminense*). Forty-five flora species are known to be endemic to St. Kitts and Nevis or to the Lesser Antilles, however none of these were found to occur within the Project site. Table 5-3 lists the species found in these areas by vegetation type and their IUCN status.

Table 5-3. Flora species recorded within the Project sites

	Type	Botanical/scientific name	Common Name	IUCN Status [15]
1	Upper Story Trees & shrubs	*Leucaena leucocephala*	River tamarind	-
2		*Melicoccus bijugatus*	Genip, Spanish Lime	-
3		*Acacia macracantha*	Casha	-
4		*Bursera simaruba*	Gum, West Indian Birch	LC
5		*Coccoloba swartzii*	Pigeon plum	-
6		*Randia aculeata*		LC
7		*Citharexylum spinosum*	Fiddlewood	LC
8		*Melia azedarach*	Chinaberry	LC
9		*Cordia sulcata*	White Manjack	LC
10		*Guettarda scabra*		LC
11		*Gliricidia sepium*	Gliricidie	LC
12		*Pimenta racemosa*	Bay leaf tree	-
13		*Ficus citrifolia**	Strangler fig	LC
14		*Hura crepitans**	Sandbox tree	-
15		*Azadirachta indica**	Neem	LC
16		*Tabebuia rosea**	White cedar, Pink Poui	LC
17		*Annona muricata**	Soursop	LC
18		*Quadrella cynophallophora***	Jamaica caper	LC
19		*Delonix regia*	Flame tree	LC
20		*Daphnopsis americana*	Mountain mahoe	-
21		*Zanthoxylum monophyllum*	Yellow prickle	-
22		*Ceiba pentandra*	Silk cotton, Kapok	LC
23	Lower Story Grasses, Herbs & vines	*Indigofera suffruticosa*	Indigo	-
24		*Indigofera tinctoria*	Indigo	-
25		*Solanum racemosum*	Canker berry	-
26		*Sansevieria hyacinthoides*	Daggerlash, iguanatail	-
27		*Jasminum fluminense*	Wild jasmine	-

[15] IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-1

	Type	Botanical/scientific name	Common Name	IUCN Status [15]
28		*Lantana camara*	Tea bush	-
29		*Pedilanthus tithymaloides*	Ladies Slipper, Milky Bush	-
30		*Erythroxylum havanense*		LC
31		*Croton flavens*	Sage bush	LC
32		*Pluchea carolinensis*	Cattle tongue	LC
33		*Bothriochloa pertusa*	Sour grass	-
34		*Arthrostylidium venezuelae*	Climbing bamboo grass	-
35		*Xiphidium caeruleum*		-
36		*Philodendron sp.*		-
37		*Stachytarpheta jamaicensis*	Vervain	-
38		*Crotalaria retusa*	Shak shak bean	-
39		*Jatropha gossypifolia*	Belly Ache Bush	-
40		*Ricinus communis*	Castor bean	-
41		*Antigonon leptopus*	Corallita, Bee bush	-
42		*Cuscuta americana*	Dodder, Lub lub	-
43		*Cucumis dipsaceus*	Spiny cucumber	-

Source: Adapted from NREI EIA 2017

*Note: * Indicates single occurrence, ** Single unusual occurrence, LC = Least Concern, - = Not Assessed*

The IUCN Red List of Threatened Species is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. IUCN uses the following categories to rate extinction risk:
CRITICALLY ENDANGERED (CR) - A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
ENDANGERED (EN) - A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
VULNERABLE (VU) - A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.
NEAR THREATENED (NT) A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
LEAST CONCERN (LC) A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
DATA DEFICIENT (DD) A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
NOT LISTED (NL) Not listed by the IUCN.
Endemism: a species is defined to a geographical location.

Potential Flora species present within the BAOI

In 2009, the Organization of Eastern Caribbean States'(OECS) Environmental and Sustainable Development Unit conducted a rapid terrestrial biodiversity assessment of plant species occurring within the Nevis Peak proposed conservation area and surrounding areas found in the BAOI. Over 365 species of plants belonging to 102 different families with about 337 species (92%) considered native and 28 species (8%) considered introduced (OECS, 2009). The report does not mention any flora species of conservation concern. The flora species list is provided in Appendix A; however, this is a comprehensive list of species that occur in the Nevis Peak Protected Area (NPPA), which starts at an approximate elevation of 300m up to Nevis Peak (985 m).

Potential Threatened Flora Species within the BAOI

ERM screened for potentially threatened flora species occurring within the BAOI using IBAT. From the IBAT screening, 60 flora species belonging to 32 families that have the potential to occur within the BAOI. Of the potential species found in the BAOI, two species are listed as IUCN vulnerable (VU) and 58 as Least Concern (LC) according to the IUCN Red List (2020, refer to Table 5-4). Spanish cedar (*Cedrela odorata*, VU) is widespread across the neotropics and is threatened by unsustainable harvests.

Table 5-4. Potential Flora Species screened using IBAT occurring within the BAOI

No.	Scientific Name	Common name	IUCN status
1	*Cedrela odorata*	Spanish Cedar	VU
2	*Opuntia triacantha*	Big Pine Key Prickly-pear	NT
3	*Rhipsalis baccifera*	Mistletoe Cactus	LC
4	*Randia aculeata*	Indigoberry	LC
5	*Melocactus intortus*	Turk's Head	LC
6	*Pilosocereus royenii*	Royen's Tree Cactus	LC
7	*Hylocereus triangularis*	White-fleshed pitahaya	LC
8	*Selenicereus grandiflorus*	Queen of the Night	LC
9	*Opuntia stricta*	Erect Pricklypear	LC
10	*Acanthocereus tetragonus*	Triangle Cactus	LC
11	*Zannichellia palustris*	Horned Pondweed	LC
12	*Bacopa monnieri*	Water Hyssop	LC
13	*Lemna perpusilla*	Minute Duckweed	LC
14	*Halophila stipulacea*	Species code: Hs	LC
15	*Thalassia testudinum*	Species code: Tt	LC
16	*Halophila decipiens*	Paddle Grass	LC
17	*Halodule wrightii*	Species code: Hw	LC

No.	Scientific Name	Common name	IUCN status
18	*Syringodium filiforme*	Species code Sf	LC
19	*Acrostichum aureum*	Golden Leather Fern	LC
20	*Laguncularia racemosa*	White Mangrove	LC
21	*Conocarpus erectus*	Silver-leaved Buttonwood	LC
22	*Acrostichum danaeifolium*	Giant Leather Fern	LC
23	*Avicennia germinans*	Black Mangrove	LC
24	*Avicennia schaueriana*	Mangle Blanco	LC
25	*Rhizophora mangle*	Red Mangrove	LC
26	*Consolea rubescens*	Road Kill Cactus	LC
27	*Psidium amplexicaule*	Mountain Guava	LC
28	*Jatropha gossypiifolia*	Bellyache Bush	LC
29	*Physalis angulata*	Angular Winter-cherry	LC
30	*Cordia alliodora*	Manjack	LC
31	*Cordia collococca*	Clammy Cherry	LC
32	*Cordia sulcata*	White Manjack	LC
33	*Varronia bullata*	-	LC
34	*Varronia bullata subsp. humilis*	-	LC
35	*Chiococca alba*	Snowberry	LC
36	*Guettarda scabra*	-	LC
37	*Ernodea littoralis*	Coughbush	LC
38	*Strumpfia maritima*	-	LC
39	*Thespesia populnea*	Portia Tree	LC
40	*Bursera simaruba*	West Indian birch	LC
41	*Pilea fontana*	Lesser Clearweed	LC
42	*Potamogeton amplifolius*	Largeleaf Pondweed	LC
43	*Saururus cernuus*	Lizard's Tail	LC
44	*Trollius laxus*	-	LC
45	*Tecoma stans*	Yellow Trumpetbush	LC
46	*Physalis cordata*	Heartleaf Groundcheryy	LC
47	*Physalis microcarpa*	-	LC
48	*Celtis iguanaea*	Iguana hackberry	LC

No.	Scientific Name	Common name	IUCN status
49	*Euphorbia tithymaloides*	Spurge	LC
50	*Casearia sylvestris*	-	LC
51	*Nectandra membranacea*	Sweetwood	LC
52	*Quadrella indica*	-	LC
53	*Bourreria succulenta*	Bahama Strongbark	LC
54	*Erythroxylum havanense*	-	LC
55	*Hippomane mancinella*	-	LC
56	*Duranta erecta*	-	LC
57	*Piper aequale*	-	LC
58	*Conostegia montana*	-	LC
59	*Palicourea pubescens*	-	LC
60	*Piper reticulatum*	-	LC

Note: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, - : No Common Name

Source: IUCN Red List

5.3.2.3 Fauna

The following section summarizes the results of terrestrial fauna species occurring within the Project Area and the BAOI.

Species present in the Project Area

Historical site activities and recent grazing limit the potential for wildlife to be present in the Project Area. According to the 2017 EIA, the only wildlife recorded within the Project Area include birds and introduced mammals. Introduced mammals include the African Green Vervet Monkey (*Chlorocebus sabaeus*), domesticated goats and feral donkeys. The only mammalian species native to Nevis are the several species of fruit-eating bats, however, baseline surveys did not record any bats species or roosts in 2017. It is possible that the abandoned buildings and ruins could provide suitable habitat for bats. According to Pederson *et al (2003),* two bat species were recorded during bat mist netting surveys within the Hamilton Estate. These include the Antillean Fruit-eating Bat *(Brachyphylla cavernarum, LC)* and the Jamacian Fruit-eating Bat (*Artibeus jamaicensis, LC).*

Apart from insects, birds are the most common type of fauna found on Nevis. Surveys of avifauna occurring within the Project Area recorded seven species, which are all considered to be Least Concern (LC) according to the IUCN Red list (2020) (refer to Table 5-5).

Table 5-5. Avian fauna recorded within Project parcels

Scientific Name	Common Name	IUCN	Migratory	Endemic[16]
Columbina passerina	Common Ground Dove	LC	Y	N
Zenaida aurita	Zenaida Dove	LC	N	N
Falco sparverius	American Kestrel	LC	Y	N
Margarops fuscatus	Pearly-eyed Thrasher	LC	N	N
Loxigilla noctis	Lesser Antillean Bullfinch	LC	N	Y
Tyrannus dominicensis	Gray Kingbird	LC	Y	N
Quiscalus lugubris	Carib Grackle	LC	N	N

Source: IUCN Red List

Potential Terrestrial Fauna Species present in the BAOI

ERM screened for potentially threatened fauna species occurring within the BAOI using IBAT, GBIF, and the OECS 2009 biodiversity assessment. From the screening, 196 fauna species potentially occur within the BAOI: 12 herpetofauna species, 13 mammalian species, and 171 bird species.

Herpetofauna

Of the 12 potential herpetofauna species found in the BAOI, 10 are Least Concern (LC), and two are Near Threatened (NT) according to the IUCN Red List (2020, refer to Table 5-6).

According to the OECS report from the NPPA biodiversity assessment, four additional herpetofauna species were included: the Lesser Antillean Iguana (*Iguana delicatissima*), Slippery-back Skink (*Mabuya bistiata*), the Orange-bellied Racer (*Alsophis rufiventris*), and Giant Ditch Frog or Mountain Chicken (*Leptodactylus fallax*). However, these species have all been extirpated from the Island with the introduction of the Indian mongoose (*Herpestes javanicus*) during colonization of the island in the 1600s (OECS, 2009).

Table 5-6. Potential Herpetofauna Species

No.	Class	Scientific Name	Common name	Cat.	Introduced	Endemic
1	*AMPHIBIA*	*Rhinella marina*	*Cane Toad*	*LC*	Y	N
2	*AMPHIBIA*	*Eleutherodactylus johnstonei*	*Lesser Antillean Whistling Frog*	*LC*	N	Y
3	*AMPHIBIA*	*Osteopilus septentrionalis*	*Cuban Tree Frog*	*LC*	Y	N
4	*REPTILIA*	*Pholidoscelis erythrocephalus*	*St. Christopher Ameiva*	*NT*	N	Y
5	*REPTILIA*	*Anolis bimaculatus*	*Statia Bank Tree Anole*	*LC*	N	Y

[16] Endemism is defined, for the purpose of this ESIA, as occurring only within the Lesser Antilles islands, which include Antigua and Barbuda, Barbados, Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, St Vincent and the Grenadines and Trinidad and Tobago

No.	Class	Scientific Name	Common name	Cat.	Introduced	Endemic
6	*REPTILIA*	*Thecadactylus rapicauda*	*Turniptail Gecko*	*LC*	N	N
7	*REPTILIA*	*Sphaerodactylus sputator*	*Island Least Gecko*	*LC*	N	Y
8	*REPTILIA*	*Sphaerodactylus sabanus*	*Saba Least Gecko*	*LC*	N	N
9	*REPTILIA*	*Hemidactylus mabouia*	*House Gecko/Woodslave*	-	Y	N
10	*REPTILIA*	*Antillotyphlops monastus*	*Montserrat Worm Snake*	*NT*	N	Y
11	*REPTILIA*	*Anolis schwartzi*	*Schwartz Anole*	-	N	N
12	*REPTILIA*	*Anolis wattsi*	*Watts Anole*	-	N	N

Source: IUCN Red List

Mammals

All of the 13 potential mammalian species found in the BAOI are Least Concern (LC) according to the IUCN Red List (2020). The only native species are bats who serve as primary pollinators and seed dispersers. However, five of these species are introduced (refer to Table 5-7) of which include the introduced and invasive Black Rat (*Rattus rattus*), the Norway or Brown Rat (*R. norvegicus*), the House Mouse (*Mus musculus*), the Indian Mongoose, and the African Green Vervet Monkey (*Chlorocebus sabaeus*).

The Indian Mongoose, introduced in the late 1800s to control rats that infested sugar cane plantations, preys on birds, amphibians, reptiles and invertebrates, and as previously mentioned, has extirpated several species of reptiles, birds, and an Agouti (*Dasyprocta* sp.) and a native rice or muskrat (*Megalomys* sp.). The African Green Vervet Monkey was introduced from West Africa approximately 300 years ago as pet, escaped, naturalized, and may have a population of about 2,000 individuals (OECS, 2009).

Table 5-7. Potential Mammalian Species

No.	Order	Scientific Name	Common name	IUCN status	Introduced	Endemic
1	CHIROPTERA	*Ardops nichollsi*	Tree Bat	LC	N	Y
2	CHIROPTERA	*Brachyphylla cavernarum*	Antillean Fruit-eating Bat	LC	N	N
3	CHIROPTERA	*Molossus molossus*	Velvety Free-tailed Bat	LC	N	N
4	CHIROPTERA	*Natalus stramineus*	Mexican Funnel-eared Bat	LC	N	N
5	CHIROPTERA	*Noctilio leporinus*	Greater Bulldog Bat	LC	N	N
6	CHIROPTERA	*Tadarida brasiliensis*	Brazilian Free-tailed Bat	LC	N	N
7	CHIROPTERA	*Artibeus jamaicensis*	Jamaican Fruit-eating Bat	LC	N	N
8	CHIROPTERA	*Monophyllus plethodon*	Insular Single Leaf Bat	LC	N	Y

No.	Order	Scientific Name	Common name	IUCN status	Introduced	Endemic
9	RODENTIA	*Mus musculus*	House Mouse	LC	Y	N
10	RODENTIA	*Rattus rattus*	Black Rat	LC	Y	N
11	RODENTIA	*Rattus norvegicus*	Norway Rat	LC	Y	N
12	CARNIVORA	*Herpestes javanicus*	Indian Mongoose	LC	Y	N
13	PRIMATE	*Chlorocebus sabaeus*	African Green Vervet Monkey	LC	Y	N

Source: IUCN Red List

Avifauna

Depending on the season, avian species fluctuate greatly on Nevis as bird migrations depend on rainfall amounts, food availability, and nesting habitat. Migratory birds use the Island as a stop over as part of the northward migration in the spring (March through May, Climatestotravel.com), as species fly up the Lesser Antillean chain from South America (OECS, 2009).

Of the 171 potential avifauna species found in the BAOI, according to the IUCN Red List (2020, refer to Table 5-8), one species is Endangered (EN), two species are vulnerable (VU), one is Near Threatened (NT) and 167 are Least Concern (LC).

Both the endangered Black-capped Petrel (*Pterodroma hasitata*) and the vulnerable Black Swift (*Cypseloides niger*) are migrants that typically inhabit areas at high elevations (greater than 1,000 m), commonly along steep inaccessible forested cliffs (IUCN 2020) and are unlikely to inhabit the Project area. The vulnerable West Indian Whistling Duck (*Dendrocygna arborea*) typically resides in terrestrial forests, inland wetlands, and marine coastal and tidal areas. However, it is only an occasional visitor to Nevis due to habitat deterioration (Birdlife International, 2006). The near threatened White-crowned Pigeon (*Patagioenas leucocephala*) species is typically found in forested areas with a maximum elevation of 1,500 m (Birdlife International, 2016).

Table 5-8. Potential Avifauna in the BAOI

No.	Scientific Name	Common name	category	Endemic
1	***Pterodroma hasitata***	**Black-capped Petrel**	**EN**	**N**
2	***Cypseloides niger***	**Black Swift**	**VU**	**N**
3	*Numida meleagris*	Helmeted Guineafowl	LC	N
4	*Dendrocygna bicolor*	Fulvous Whistling-duck	LC	N
5	*Mareca americana*	American Wigeon	LC	N
6	*Spatula discors*	Blue-winged Teal	LC	N
7	*Anas bahamensis*	White-cheeked Pintail	LC	N
8	*Anas acuta*	Northern Pintail	LC	N
9	*Megaceryle alcyon*	Belted Kingfisher	LC	N
10	*Megaceryle torquata*	Ringed Kingfisher	LC	N

No.	Scientific Name	Common name	category	Endemic
11	*Coccyzus americanus*	Yellow-billed Cuckoo	LC	N
12	*Coccyzus minor*	Mangrove Cuckoo	LC	N
13	*Crotophaga ani*	Smooth-billed Ani	LC	N
14	*Streptoprocne zonaris*	White-collared Swift	LC	N
15	*Eulampis jugularis*	Purple-throated Carib	LC	N
16	*Eulampis holosericeus*	Green-throated Carib	LC	Y
17	*Orthorhyncus cristatus*	Antillean Crested Hummingbird	LC	Y
18	*Athene cunicularia*	Burrowing Owl	LC	N
19	*Chordeiles minor*	Common Nighthawk	LC	N
20	*Chordeiles gundlachii*	Antillean Nighthawk	LC	N
21	*Patagioenas squamosa*	Scaly-naped Pigeon	LC	N
22	*Zenaida aurita*	Zenaida Dove	LC	N
23	*Columbina passerina*	Common Ground-dove	LC	N
24	*Geotrygon mystacea*	Bridled Quail-dove	LC	N
25	*Geotrygon montana*	Ruddy Quail-dove	LC	N
26	*Porzana carolina*	Sora	LC	N
27	*Porphyrio martinicus*	Purple Gallinule	LC	N
28	*Numenius phaeopus*	Whimbrel	LC	N
29	*Bartramia longicauda*	Upland Sandpiper	LC	N
30	*Tringa melanoleuca*	Greater Yellowlegs	LC	N
31	*Tringa flavipes*	Lesser Yellowlegs	LC	N
32	*Tringa solitaria*	Solitary Sandpiper	LC	N
33	*Actitis macularius*	Spotted Sandpiper	LC	N
34	*Tringa semipalmata*	Willet	LC	N
35	*Arenaria interpres*	Ruddy Turnstone	LC	N
36	*Limnodromus griseus*	Short-billed Dowitcher	LC	N
37	*Limnodromus scolopaceus*	Long-billed Dowitcher	LC	N
38	*Calidris alba*	Sanderling	LC	N
39	*Calidris mauri*	Western Sandpiper	LC	N
40	*Calidris minutilla*	Least Sandpiper	LC	N

No.	Scientific Name	Common name	category	Endemic
41	*Calidris fuscicollis*	White-rumped Sandpiper	LC	N
42	*Calidris melanotos*	Pectoral Sandpiper	LC	N
43	*Calidris himantopus*	Stilt Sandpiper	LC	N
44	*Calidris pugnax*	Ruff	LC	N
45	*Pluvialis dominica*	American Golden Plover	LC	N
46	*Pluvialis squatarola*	Grey Plover	LC	N
47	*Charadrius semipalmatus*	Semipalmated Plover	LC	N
48	*Charadrius wilsonia*	Wilson's Plover	LC	N
49	*Charadrius vociferus*	Killdeer	LC	N
50	*Stercorarius pomarinus*	Pomarine Jaeger	LC	N
51	*Larus atricilla*	Laughing Gull	LC	N
52	*Thalasseus maximus*	Royal Tern	LC	N
53	*Thalasseus sandvicensis*	Sandwich Tern	LC	N
54	*Sterna dougallii*	Roseate Tern	LC	N
55	*Sterna hirundo*	Common Tern	LC	N
56	*Sternula antillarum*	Least Tern	LC	N
57	*Onychoprion anaethetus*	Bridled Tern	LC	N
58	*Onychoprion fuscatus*	Sooty Tern	LC	N
59	*Chlidonias niger*	Black Tern	LC	N
60	*Anous stolidus*	Brown Noddy	LC	N
61	*Anous minutus*	Black Noddy	LC	N
62	*Pandion haliaetus*	Osprey	LC	N
63	*Elanoides forficatus*	Swallow-tailed Kite	LC	N
64	*Falco sparverius*	American Kestrel	LC	N
65	*Falco columbarius*	Merlin	LC	N
66	*Tachybaptus dominicus*	Least Grebe	LC	N
67	*Podilymbus podiceps*	Pied-billed Grebe	LC	N
68	*Phaethon aethereus*	Red-billed Tropicbird	LC	N
69	*Phaethon lepturus*	White-tailed Tropicbird	LC	N
70	*Sula sula*	Red-footed Booby	LC	N

No.	Scientific Name	Common name	category	Endemic
71	*Sula leucogaster*	Brown Booby	LC	N
72	*Egretta tricolor*	Tricolored Heron	LC	N
73	*Egretta caerulea*	Little Blue Heron	LC	N
74	*Egretta thula*	Snowy Egret	LC	N
75	*Ardea herodias*	Great Blue Heron	LC	N
76	*Ardea alba*	Great White Egret	LC	N
77	*Bubulcus ibis*	Cattle Egret	LC	N
78	*Nyctanassa violacea*	Yellow-crowned Night-heron	LC	N
79	*Nycticorax nycticorax*	Black-crowned Night-heron	LC	N
80	*Plegadis falcinellus*	Glossy Ibis	LC	N
81	*Fregata magnificens*	Magnificent Frigatebird	LC	N
82	*Puffinus puffinus*	Manx Shearwater	LC	N
83	*Elaenia martinica*	Caribbean Elaenia	LC	N
84	*Myiarchus oberi*	Lesser Antillean Flycatcher	LC	Y
85	*Tyrannus tyrannus*	Eastern Kingbird	LC	N
86	*Tyrannus dominicensis*	Grey Kingbird	LC	N
87	*Vireo altiloquus*	Black-whiskered Vireo	LC	N
88	*Mimus gilvus*	Tropical Mockingbird	LC	N
89	*Cinclocerthia ruficauda*	Brown Trembler	LC	Y
90	*Allenia fusca*	Scaly-breasted Thrasher	LC	N
91	*Margarops fuscatus*	Pearly-eyed Thrasher	LC	N
92	*Progne dominicensis*	Caribbean Martin	LC	N
93	*Hirundo rustica*	Barn Swallow	LC	N
94	*Petrochelidon pyrrhonota*	Cliff Swallow	LC	N
95	*Setophaga americana*	Northern Parula	LC	N
96	*Setophaga pensylvanica*	Chestnut-sided Warbler	LC	N
97	*Setophaga caerulescens*	Black-throated Blue Warbler	LC	N
98	*Setophaga castanea*	Bay-breasted Warbler	LC	N
99	*Setophaga petechia*	American Yellow Warbler	LC	N

No.	Scientific Name	Common name	category	Endemic
100	*Setophaga magnolia*	Magnolia Warbler	LC	N
101	*Setophaga virens*	Black-throated Green Warbler	LC	N
102	*Setophaga striata*	Blackpoll Warbler	LC	N
103	*Setophaga tigrina*	Cape May Warbler	LC	N
104	*Setophaga discolor*	Prairie Warbler	LC	N
105	*Mniotilta varia*	Black-and-white Warbler	LC	N
106	*Setophaga ruticilla*	American Redstart	LC	N
107	*Protonotaria citrea*	Prothonotary Warbler	LC	N
108	*Seiurus aurocapilla*	Ovenbird	LC	N
109	*Parkesia noveboracensis*	Northern Waterthrush	LC	N
110	*Parkesia motacilla*	Louisiana Waterthrush	LC	N
111	*Setophaga citrina*	Hooded Warbler	LC	N
112	*Coereba flaveola*	Bananaquit	LC	N
113	*Piranga olivacea*	Scarlet Tanager	LC	N
114	*Melanospiza bicolor*	Black-faced Grassquit	LC	N
115	*Pyrrhulagra portoricensis*	Puerto Rican Bullfinch	LC	N
116	*Icterus galbula*	Baltimore Oriole	LC	N
117	*Quiscalus lugubris*	Carib Grackle	LC	N
118	*Molothrus bonariensis*	Shiny Cowbird	LC	N
119	*Dolichonyx oryzivorus*	Bobolink	LC	N
120	*Circus hudsonius*	Northern Harrier	LC	N
121	*Oxyura jamaicensis*	Ruddy Duck	LC	N
122	*Himantopus himantopus*	Black-winged Stilt	LC	N
123	*Butorides striata*	Green-backed Heron	LC	N
124	*Anas crecca*	Common Teal	LC	N
125	*Gallinago delicata*	Wilson's Snipe	LC	N
126	*Pelecanus occidentalis*	Brown Pelican	LC	N
127	*Loxigilla noctis*	Lesser Antillean Bullfinch	LC	N
128	*Icterus icterus*	Venezuelan Troupial	LC	N
129	*Sula dactylatra*	Masked Booby	LC	N

No.	Scientific Name	Common name	category	Endemic
130	*Falco peregrinus*	Peregrine Falcon	LC	N
131	*Puffinus lherminieri*	Audubon's Shearwater	LC	N
132	*Gelochelidon nilotica*	Common Gull-billed Tern	LC	N
133	*Gallinula galeata*	Common Gallinule	LC	N
134	*Rallus crepitans*	Clapper Rail	LC	N
135	*Fulica americana*	American Coot	LC	N
136	*Setophaga coronata*	Myrtle Warbler	LC	N
137	*Riparia riparia*	Collared Sand Martin	LC	N
138	*Hydrobates castro*	Band-rumped Storm-petrel	LC	N
139	*Hydrobates jabejabe*	Cape Verde Storm-petrel	LC	N
140	*Pelicanus occidentalis*	Brown Pelican	LC	N
141	*Ardea heroidias*	Great Blue Heron	LC	N
142	*Ardea alba*	Great Egret	LC	N
143	*Butorides virescens*	Green Heron	LC	N
144	*Nycticorax nycticorax*	Black-crowned Night Heron	LC	N
145	*Nyctanassa violacea*	Yellow-crowned Night Heron	LC	N
146	*Dendrocygna bicolor*	Fulvous Whistling Duck	LC	N
147	***Dendrocygna arborea***	**West Indian Whistling Duck**	**VU**	N
148	*Anas crecca*	Green-winged Teal	LC	N
149	*Buteo platypterus*	Broad-winged Hawk	LC	N
150	*Rallus longirostris*	Clapper Rail	LC	N
151	*Gallinula chloropus*	Common Gallinule	LC	N
152	*Charadrius alexandrinus*	Snowy Plover	LC	N
153	*Pluvialis dominicus*	Black-bellied Plover	LC	N
154	*Haematopus palliatus*	American Oystercatcher	LC	N
155	*Himantopus himantopus*	Black-necked Stilt	LC	N
156	*Actitis macularia*	Spotted Sandpiper	LC	N
157	*Tringa semipalmatus*	Willet	LC	N

No.	Scientific Name	Common name	category	Endemic
158	*Limosa haemastica*	Hudsonian Godwit	LC	N
159	***Patagioenas leucocephala***	**White-crowned Pigeon**	**NT**	N
160	*Columbina passerina*	Common Ground Dove	LC	N
161	*Geotrygon mystacea*	Bridled Quail Dove	LC	N
162	*Geotrygon montana*	Ruddy Quail Dove	LC	N
163	*Megaceryle alcyon*	Belted Kingfisher	LC	N
164	*Tyrannus dominicensis*	Gray Kingbird	LC	N
165	*Vireo flavifrons*	Yellow-throated Vireo	LC	N
166	*Helmitheros vermivorus*	Worm-eating Warbler	LC	N
167	*Seiurus aurocapillus*	Ovenbird	LC	N
168	*Geothlypis formosa*	Kentucky Warbler	LC	N
169	*Wilsonia citrina*	Hooded Warbler	LC	N
170	*Euphonia musica*	Antillean Euphonia	LC	N
171	*Tiaris bicolor*	Black-faced Grassquit	LC	N

Source: IUCN Red List

5.3.3 Protected Areas

There are no officially protected areas in Nevis. However, a marine management area surrounds the island, in addition, a proposed national park; the Nevis Peak Protected Area (NPPA) occurs at the highest elevations of the island, above the 300 m contour level.

5.3.3.1 Marine Management Reserve

The 2016 Fisheries, Aquaculture and Marine Resources Act (FAMRA) designated a 3.2-kilometer radius of ocean surrounding Nevis and St, Kitts as a Marine Management Area. This marine area contains the largest living reef system in the waters surrounding Nevis (Point Impact Analysis, EIA 2017). The Management Area was designated by the government as a multiple use marine zone to maintain reef biodiversity, support ecosystem services, improve fisheries, provide tourism opportunities, and return socioeconomic benefits to local communities (EIA, 2017). There are four species of sea turtles reported to use these waters and nest along the island, of these include, the Hawksbill (*Eretmochelys imbricata*), the Green (*Chelonia mydas*) and the Leatherback (*Dermochelys coriacea;* (OECS, 2009; Agostini *et al* 2010). The area contains a wide range of marine habitats, which include robust stony coral reefs, a distinctive patch of shallow-water Elkhorn Coral (*Acropora palmata)*, soft coral and algal communities, two types of seagrass, and a variety of marine sediment types (OECS, 2009). The Marine management zone falls within 3 km of the Project.

5.3.3.2 Nevis Peak

In December 2008, as part of the draft Nevis Physical Development Plan, the NPPA was proposed as a designated area of protection. The management plan for the NPPA was prepared in June 2009, which proposed that the site be an IUCN Category IV protected area (Habitat/Species Management Area).

Nevis Peak is proposed National park covering an area of 12.37 km^2. The peak is a volcanic formation and encompasses rainforests and water resources that drain to the Camps watershed and others. A rapid terrestrial biodiversity inventory and status assessment of NPPA and surrounding areas, conducted by the Organization of Eastern Caribbean States' (OECS) Environmental and Sustainable Development Unit funded by USAID, recorded over 365 species of flora belonging to 102 different families, with 92% considered native. However, due to the rapid assessment of these surveys OECS estimated that the number of flora species would be closer to 1,500 species. Additionally, these surveys recorded 90 species of birds and 14 herpetofauna species, eight bat species, and five introduced mammals (OECS, 2009). The Nevis Peak conservation area is approximately 1 km from the project area and aims to conserve the forested area from development above the 300 m (1,000 ft) contour elevation line (Point Impact Analysis, EIA, 2017).

5.3.3.3 Key Biodiversity Areas / Important Bird Areas

Two internationally recognized Important Bird Areas (IBAs) [17] occur within 10 km of the Project Area, along the coast between Nevis and St. Kitts, of which include Booby Island and the Ponds of the Southeast Peninsula.

Booby Island

Booby Island IBA is a small (approximately one-hectare), circular islet located approximately halfway between the islands of St. Kitts and Nevis. The IBA supports about 425 pairs of breeding seabirds of various species. Species include the Laughing Gulls (*Larus atricilla, IUCN LC*) Bridled Terns (*Onychoprion anaethetus, IUCN LC*), Red-billed Tropicbird (*Phaethon aethereus*, IUCN LC), Roseate Tern (*Sterna dougallii, IUCN LC*), Sooty Tern (*Onychoprion fuscata, IUCN LC*), Roseate Stern (*Sterna dougallii, IUCN LC)* and Brown Noddy (*Anous stolidus, IUCN LC).* It is the only recorded breeding site within the Federation of St Kitts and Nevis for a number of these species (Collier & Brown, 2008).

Southeast Peninsula Ponds

South-east Peninsula Ponds IBA encompasses an arid area of low hills, eight salt ponds, coastal cliffs, and beaches on the South-east Peninsula of St Kitts**.** It is considered one of the largest wetlands in St Kitts (Gardner 2006), and an important breeding site for seabirds and water birds, of which include populations of Least Tern (*Sterna antillarum*, IUCN LC), and the Brown Pelican (*Pelecanus occidentalis, IUCN LC*). Presence of Roseate Stern (*Sterna dougallii, IUCN LC)* needs to be determined as it was recorded in the mid-1990s*.* The IBA is used as a nesting site for Leatherback (*Dermochelys coriacea, IUCN VU),* Hawksbill (*Eretmochelys imbricata, IUCN CR)*, and Green turtles (*Chelonia mydas, IUCN EN*; Collier & Brown, 2008).

5.4 Socio-economic Baseline

This section describes the baseline socioeconomic conditions of the Area of Social Influence of the Geothermal Campaign Project in Nevis, located in its majority in the St. Paul Charlestown Parish, with several components of the Project Footprint extending into the St. John's Figtree Parish.[18]

[17] BirdLife International (2020) Important Bird Areas

[18] Part of the Project Footprint is in the St. John Figtree Parish. This includes the transmission line, which will be underground, and the substation, which is already built and being operated by NEVLEC. It should be noted that St. Paul Charlestown Parish is likely more representative of the ADI for multiple reasons, including: the fact that the transmission line will be underground and will therefore have less of an impact than the geothermal plots; the fact that the St. John Figtree Parish is much larger and more rural, extending far past the transmission line, which means that it is not necessarily representative of where the Project is located; and the fact that Charlestown is mostly located in the St. Paul Charlestown Parish. Nevertheless, where possible, information has been included on St. John's parish.

ERM's social team conducted a baseline study that describes the current socio-economic and cultural conditions within the study area. The objectives of the baseline were:

- To gain an understanding of current demographic, social, economic, public health and cultural conditions in the Project-affected area at the household, community and regional levels, allowing for assessment of different receptor groups' general level of vulnerability to predicted Project impacts; and
- To fulfill specific stakeholder engagement objectives – both maintaining transparent communication with stakeholders through the sharing of up to date Project information, and collection of relevant data to inform the stakeholder engagement strategy.

This baseline is intended to provide information on the socioeconomic context in which the Project would be situated, to a level of detail sufficient to identify and characterize the potential impacts to socioeconomic resources that could result from the Project and its activities.

The sections below provide information on the socio-economic profile of the island of Nevis as a whole, setting the stage for a good understanding of the Project's Area of Direct Influence (ADI). The information for this section is derived from secondary sources including international organizations such as the World Bank, the World Health Organization and the Caribbean Development Bank; national agencies such as the Social Security Board, and the Nevis Tourism Authority; and national development plans and strategies.

Within each section, the context for Nevis and the ADI are described. The ADI includes the Project footprint (Project parcel, transmission line routes, substation); the Long Point port, which the Project will use for cargo, with the transportation routes from the Project to the port; and the city of Charlestown, where Project traffic and waste management will have an impact. The ADI is considered as the area that could be directly impacted; however, the Project would also have implications for employment, the economy, planning, and service provision in the whole of the island of Nevis. Therefore, the entire island of Nevis will be considered the Area of Indirect Influence (AII). As such, while emphasis is placed on the area immediately adjacent to the Project, details on the island and their relationship to the Project site are also described as relevant in this section. In June-July 2020, ERM's socioeconomic specialists conducted a desktop review and a range of phone interviews with government, NGOs, service providers and community stakeholders in Nevis collect the baseline information presented herein.

5.4.1 Methodology

The social baseline study has been developed considering the main socioeconomic indicators that allow characterizing the living conditions of the population of the study area. For this purpose, various sources of secondary information were used, mainly from the following institutions:

- Caribbean Agricultural Research and Development Institute (CARDI)
  - Country Highlights, 2009
  - Annual Report, 2011
- Caribbean Development Bank (CDB)
  - Country Gender Assessment, St. Kitts and Nevis, 2014
  - Economic Brief, St. Kitts and Nevis, 2018
  - Country Strategy Paper, St. Kitts and Nevis, 2013-2016
  - Country Poverty Assessment, St. Kitts and Nevis, 2007-08
  - Country National Biodiversity Strategy and Action Plan, St. Kitts and Nevis, 2004
- Pan American Health Organization (PAHO)

- Country Report: Saint Kitts and Nevis

- Caribbean Community (CARICOM)
  - Statistics Reports
- The World Bank
- US Census
  - International Data Base, St. Kitts and Nevis
- The Commonwealth
  - Member Countries: St. Kitts and Nevis
- Commonwealth Local Government Forum
  - Country Profile, St. Kitts and Nevis, 2017-2018
- Columbia University
  - Center for International Earth Science Information Network
- The Journal of Race & Policy
  - The Culture of St. Kitts and Nevis
- Nevis Tourism Authority
- Nevis Statistics Department
- UNESCO
  - Country Facts: St. Kitts and Nevis
- Nevis Air & Seaport Authority (NASPA)
- United States Department of State
  - Country Reports on Human Rights Practices: Saint Kitts and Nevis, 2018
- St. Kitts and Nevis Social Security Board
  - Statistics Digest 2011
  - Annual Report 2015
- St. Kitts Ministry of Industry, Commerce and Consumer Affairs
  - Local Supermarket Prices, 2016
- Eastern Caribbean Central Bank
  - Real Sector Statistics
- St. Kitts Solid Waste Management Corporation
- Jurisdiction Project by Island Studies
  - Nevis Factsheet
- United Nations Development Program
  - Third International Conference on Small Island Developing States, St. Kitts and Nevis Background Report, 2014

- Human Development Report, 2019

Additionally, other sources of secondary information corresponding to studies carried out by private entities have been consulted:

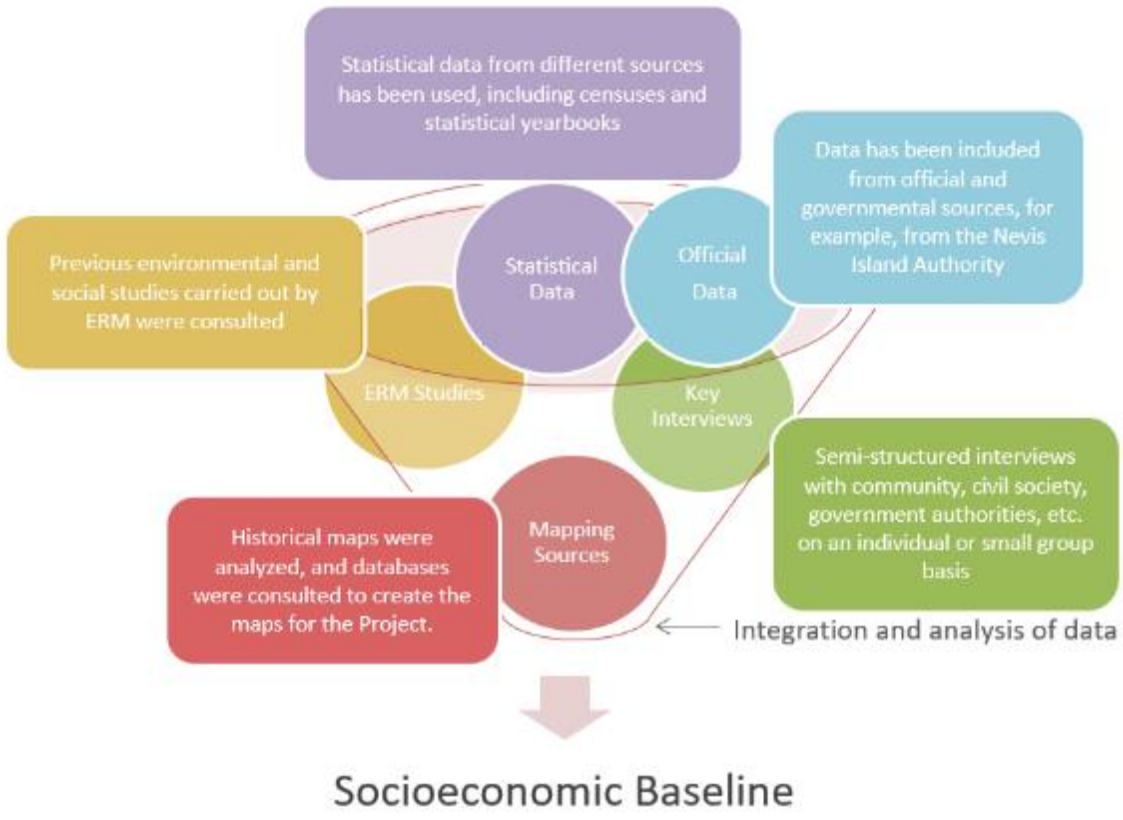
- *Environmental Impact Assessment of the Nevis Binary Geothermal Development Project. Conducted for Nevis Renewable Energy International INC. Point Impact Analysis LLC & MIG. 2017 (Referred to as "EIA")*
- *Addendum to the 2017 Environmental Impact Assessment of the Nevis Binary Geothermal Development Project. Conducted for Nevis Renewable Energy International INC. Point Impact Analysis LLC & MIG. 2020 (Referred to as "Addendum to EIA").*
- *Hamilton Estate Feasibility Report. Conducted by Thermal Energy Partners, 2019.*

In addition to the search, systematization and analysis of secondary information, we used qualitative methodology, and specifically conducted a series of semi-structured interviews by phone with different project stakeholders. These interviews focused on those indicators and socioeconomic variables that could be affected by the activities of the project, with special emphasis on tourism and energy issues. Finally, we also considered, as part of the interviews, questions related to the feelings of the population in relation to the project. Each of the interviews conducted are detailed below:

Table 5-9. Interviews conducted

Interviewee's name	Title / Organization	Date of Interview
Mackie Tross	NREI Local Contact	June 11th, 2020
Richard Payne	Engineering Manager, Four Seasons Resort	June 19th, 2020
Robelto	LEFCO Construction	June 19th, 2020
Shelly Wicks	NASPA	June 19th, 2020
Gilroy Pultie	GM, NEVLEC	June 23rd, 2020
Andrew Hendrickson	GM, Nevis Solid Waste Management Authority	June 23rd, 2020
Carino Hamilton Estate Resident #1	Private Resident	June 26th, 2020
Carino Hamilton Estate Resident #2	Private Resident	July 6th, 2020
Dr. Ernie Stapleton	Permanent Secretary, Ministry of Communications, Public Works, Water Services, Physical Planning and Environment, Posts and Labour, NIA	June 30th, 2020
Ms. Pauline Ngunjiri	Executive Director of Nevis Historical and Conservation Society	July 19, 2020
Ms. Patricia Claxton	Chairperson Nevis Division, Chamber of Industry and Commerce	July 26, 2020
Duncan Mills	Heavy Equipment Operator	July 27, 2020

Source: ERM, June 2020



Source: ERM, 2020

Figure 5-18. Baseline Sources

5.4.1.1 Data Limitations and Gaps

The main general limitations of the data include:

- The main sources of information usually show data that are more than 5 years old, a time recommended by good international practices for social diagnoses. Thus, for example, the Country Poverty Assessment is from 2007-08 and the information from the Social Security Board is from 2011 and 2015. However, the Nevis Statistical Digest from 2018 is also used to provide context for the current situation.
- Most public sources of information include data at the national levels. Data disaggregated to the level of community is almost nonexistent.

5.4.2 National Context

The Federation of Saint Kitts and Nevis (SKN) has a combined area of 261 km^2. Nevis lies southeast of St. Kitts and occupies an area of 93 km^2. The citizens of SKN enjoy a high standard of living relative to the region. A colony of England until 1983, the Federation of St. Kitts and Nevis is part of the British Commonwealth and adheres to English common law. A unicameral parliament governs St. Kitts and Nevis; Nevis holds three of the 11 seats. As part of a federation, the island of Nevis enjoys a measure of independence and can secede from the country with a two-thirds vote in referendum (Department of

Finance, 2017). The local government of Nevis, composed of the Nevis Island Assembly and the Nevis Island Administration (NIA), has autonomy except with regards to foreign affairs, defense and some aspects of economic policy.

Amerindians inhabited the island of Nevis as early as 2000 BC, but their presence on the island ended in the 17th century following the arrival of European settlers (Lowery, 2010). In the early colonial period, settlers imported African slaves to work on sugar plantations. Great Britain abolished slavery throughout the British Empire in 1833 (Britannia, 2005).

Traditionally, the sugar industry, nationalized in 1975, dominated the economies of SKN, but it closed in 2005 after declining for decades (Avameg, 2010). Today, tourism, construction, government services, manufacturing, banks, and insurance make the largest contributions to the gross domestic product (GDP), and tourism is the largest foreign exchange earner (EIA). While the economy of SKN has shown better than average rates of growth, it is vulnerable to shocks. The country has been hit by several hurricanes in recent years that have caused hotel closures and extensive property damage. Currently, the COVID-19 pandemic will likely have a negative effect on the country's economy due to a decrease in tourism. As the economy of SKN transitions towards the service, information and finance sectors, the government is making a strong commitment to education (EIA). SKN has a high literacy rate and spends 9.3 percent of its GDP on education (EIA).

SKN held general elections on June 5, 2020. There was a CARICOM Election Observation Mission present to oversee the elections, and they found no major concerns.[19] Team Unity, a three-party coalition, secured eight out of eleven constituencies. Dr. Timothy Harris was sworn in on June 7 for his second and final term as Prime Minister.[20] With regard to Nevis, Mark Brantley, Foreign Minister and Premier of Nevis in the outgoing cabinet, and a member of the Concerned Citizens Movement Party, secured all three constituencies on Nevis.[21]

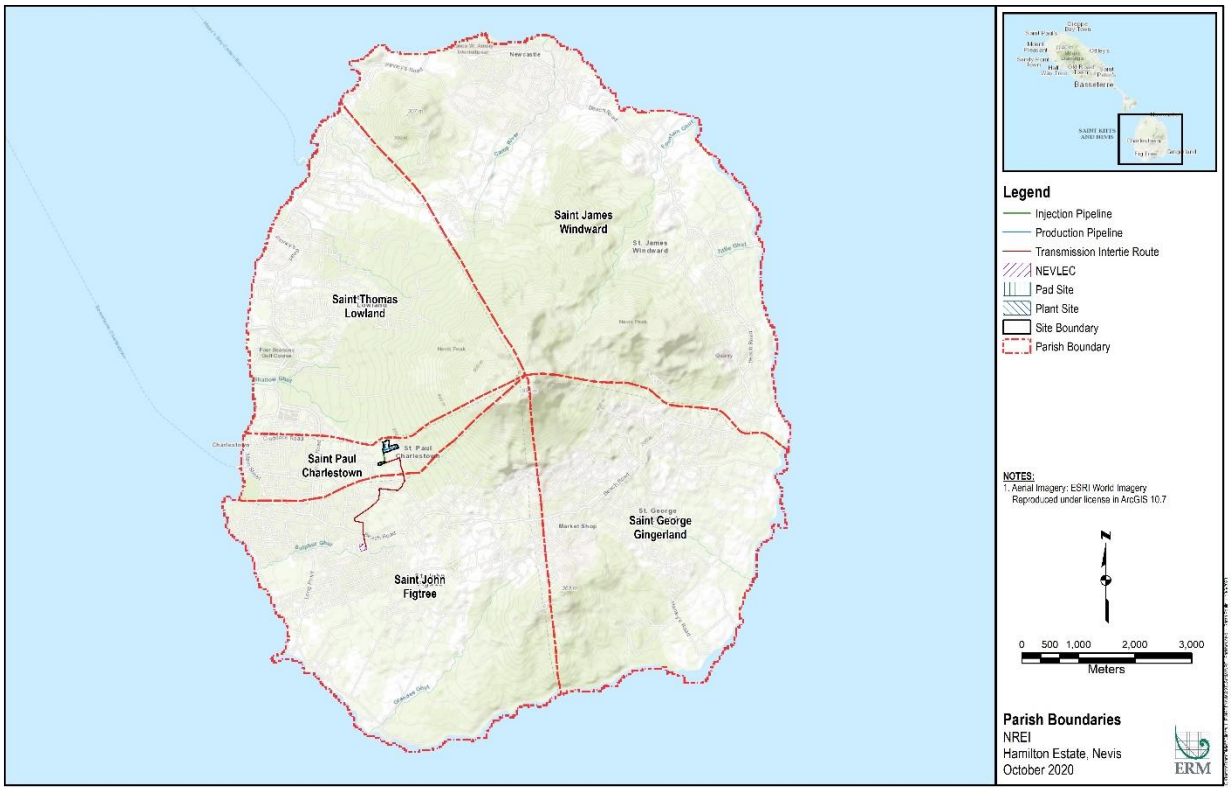
Administrative Political Divisions

Saint Kitts and Nevis are organized into 14 administrative parishes, five of which are located in Nevis. Nevis' administrative divisions and their capitals are shown on the Figure below. The Project is located in the St. Paul Charlestown Parish and St. John Figtree Parish, closely bordering the St. Thomas Lowland Parish.

[19] CARICOM, St. Kitts-Nevis Elections results reflect will of the people, accessed at: https://today.caricom.org/2020/06/07/st-kitts-nevis-elections-results-reflect-will-of-the-people-caricom-observers/

[20] Cision, Team Unity Wins General Election in St Kitts and Nevis, accessed at: https://www.prnewswire.com/news-releases/team-unity-wins-general-election-in-st-kitts-and-nevis-us-looks-forward-to-deepening-our-partnership-with-prime-minister-timothy-harris-and-his-government-301072232.html

[21] Cision, Team Unity Wins General Election in St Kitts and Nevis, accessed at: https://www.prnewswire.com/news-releases/team-unity-wins-general-election-in-st-kitts-and-nevis-us-looks-forward-to-deepening-our-partnership-with-prime-minister-timothy-harris-and-his-government-301072232.html



Source: ERM, 2020

Figure 5-19. Nevis's Parish Divisions

5.4.1 Area of Direct Influence

The ADI includes the Project Footprint and encompasses the populated areas around the Project, specifically Nevis's capital, Charlestown. Charlestown is located on the leeward side of the island of Nevis, near the southern end of Pinney's Beach. Charlestown became the chief town after Jamestown, Nevis' first settlement, was inundated by a tidal wave in 1680.[22] Most of Charlestown is located in the St. Paul Charlestown Parish. The images below show the location of the Project Footprint. It is located on parcels that are not occupied for residential purposes, with the closest residential area 0.5 miles away (EIA, 2017).

[22] Mills, G. E. M., & Momsen, J. D., 2010, Saint Kitts and Nevis, accessed at https://www.britannica.com/place/Saint-Kitts-and-Nevis

2020

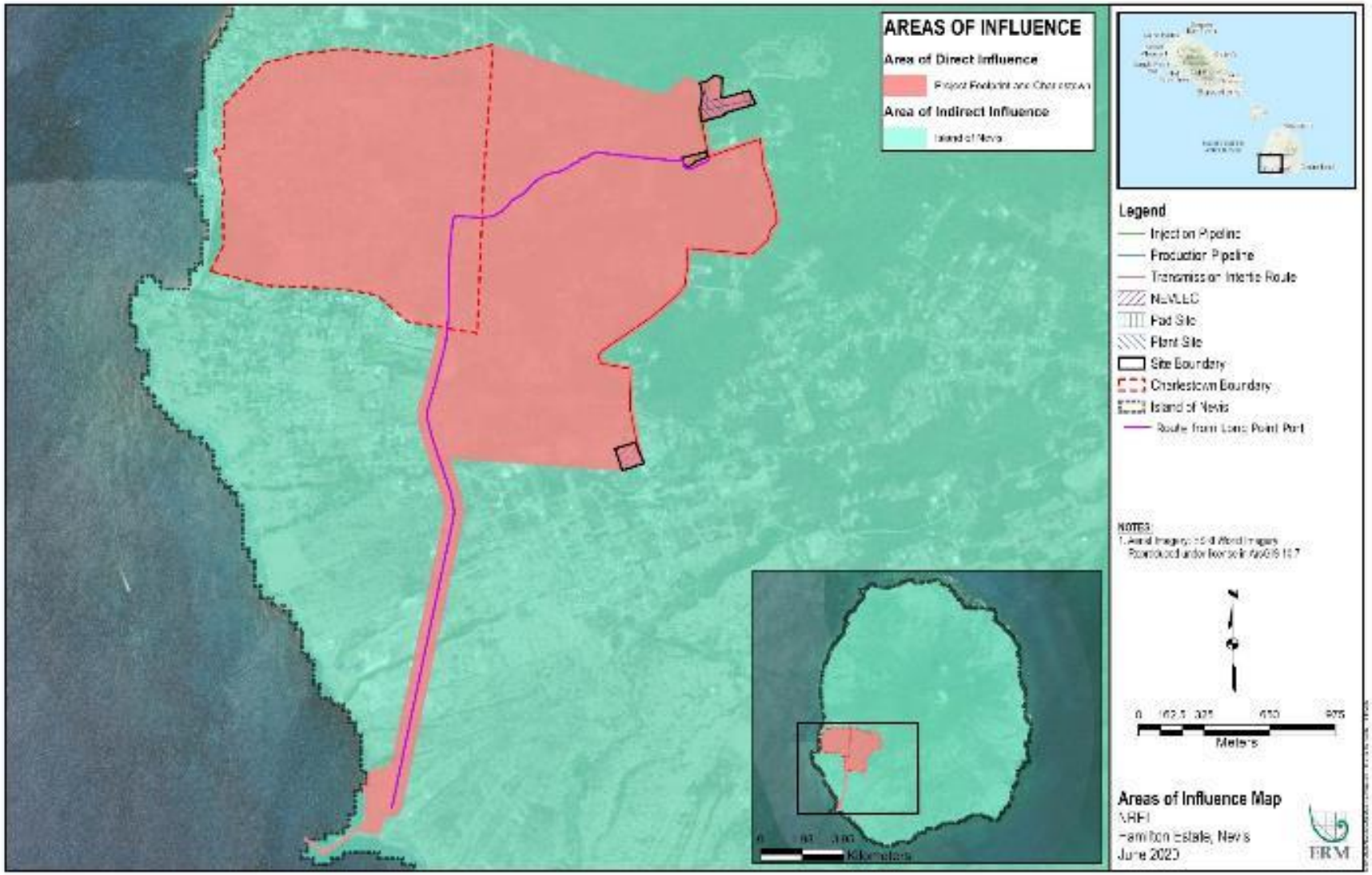
2017

Source: ERM, 2020

Figure 5-20. Land Use in ADI

The power plant and production wells will be in a former sugar cane field, and the injection well is on an unused storage site near the abandoned sugar works. Isolated residential clusters are within 0.5 miles of the proposed Hamilton Heritage Trust and Hamilton Stables parcels where the proposed binary power plant, production wells and injection well would be located. Further, Long Point Port is located in an industrial area (see Section 5.4.3.5).

The following Figure shows the geographical location of the ADI.



Source: ERM, 2020

Figure 5-21. Project ADI

5.4.2 Demography

The population of Nevis in 2011 was 11,415, with women outnumbering men by 2%, i.e. 96.95 men to every 100 females (Caribbean Development Bank (2014). *Country Gender Assessment*, Statistics Department (2012). *Preliminary Report, Population and Housing 2011 Census*, from now on "2011 Census"). The most populous city is Charlestown with just over 2,200 thousand people[23] and the least populated is Cotton Ground with 381 people (Mongabay, 2009). The life expectancy at birth in 2005 was 69.3 for males and 75.2 for females in SKN (CARICOM, St. Kitts and Nevis Statistics). There are no data disaggregated to the Charlestown or parish level on gender, but it can be assumed that the Nevis context is representative for the ADI.

Table 5-10. St Kitts and Nevis Demographic Profile

Indicators	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Mid-year population										
Males	24,135	24,445	24,765	25,085	25,415	25,750	22,840	N/A	N/A	N/A
Females	25,215	25,545	25,875	26,215	26,555	26,900	23,558	N/A	N/A	N/A
Total	49,350	49,990	50,640	51,300	51,970	52,650	46,398	N/A	N/A	N/A
Sex ratio at birth (males per 100 females)	96	96	96	96	96	96	97	N/A	N/A	N/A
Crude Birth Rate	13.5	13.2	13.6	13.8	14.4	12.5	12.5	13.7	11.8	13.8
Total Number of Births	668	662	690	709	749	656	666	636	547	641
Crude Death Rate	7.3	7.5	7.0	7.3	6.8	6.6	8.0	7.2	7.5	8.9
Total Number of Deaths	362	373	356	376	353	346	372	336	348	411
Rate of Natural Increase	6.2	5.8	6.6	6.5	7.6	5.9	6.3	6.5	4.3	5.0

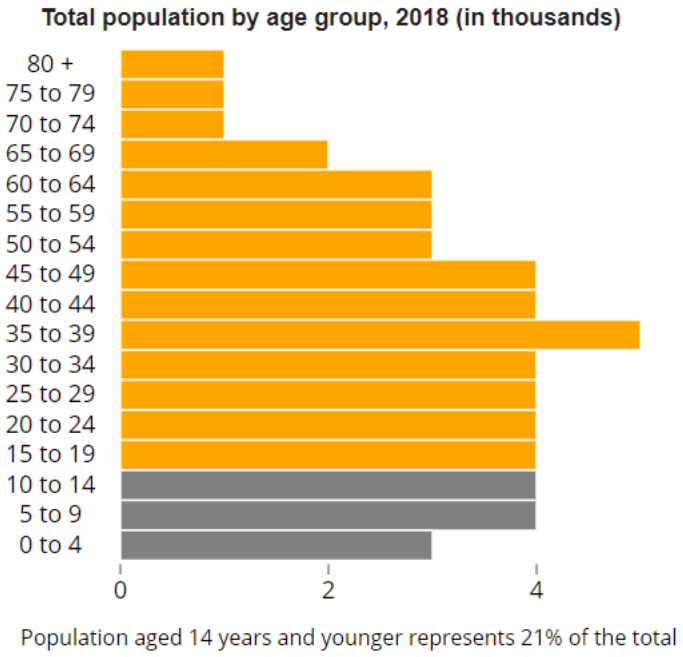
Source: CARICOM, St. Kitts and Nevis Statistics, accessed at http://statistics.caricom.org/Demography.html

5.4.2.1 Age Ranges

According to UNESCO information for 2018, the population of SKN is evenly distributed between the ages of 0 and 59 years old, with the population over 65 representing less than 7.5% of the population. While the country's population is relatively young, recent data indicate that the 35-50 age group is increasing.[24]

[23] The Commonwealth, St. Kitts and Nevis Country Information, accessed at https://thecommonwealth.org/our-member-countries/st-kitts-and-nevis

[24] UNESCO, St. Kitts and Nevis, accessed at http://uis.unesco.org/en/country/kn



Source: UNESCO, 2018

Figure 5-22. Total Population by Age Group

Charlestown is the most populous city in Nevis, with just over 2,200 thousand people.[25] The table below shows St. Paul's and St. John's population by large age groups.

Table 5-11. Population of the ADI by Large Age Groups

Parish	Population 2011	Large age groups							
		0-14 years	%	15-34 years	%	35-64 years	%	65-85+	%
St. Paul	1,847	408	22%	577	31%	698	38%	164	9%
St. John	3,827	897	23.4%	1,112	29.1%	1,465	38.3%	353	9.2%

Source: Department of Statistics, Nevis and the Statistics Division, St. Kitts

The population of the ADI is young, with the majority (53% in St. Paul and 52.5% in St. John) being under 35 years old.

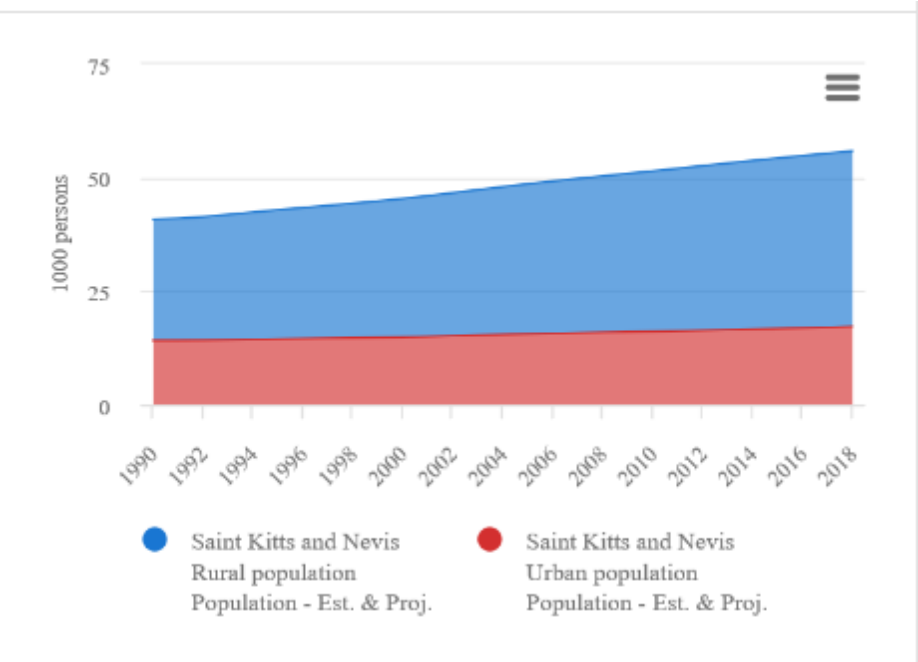
5.4.2.2 Area of Residence

The urban parish of Nevis, St. Paul, accounts for 15% of the country's population (UNESCO). In 2010, 2,200 people were residing in Charlestown, making it the biggest urbanized area on the island, and the

[25] The Commonwealth, St. Kitts and Nevis Country Information, accessed at https://thecommonwealth.org/our-member-countries/st-kitts-and-nevis.

second biggest in the country (behind Basseterre, with 13,400, and before St. Paul's with 1,300).[26] However, unlike St. Kitts, where much of the population lives in the urban area of Basseterre, the population of Nevis lives predominantly in rural areas. The largest cities and towns are Charlestown, Gingerland (population: 493), Newcastle (population: 493), and Cotton Ground (population: 381) (Mongabay, 2009).

With respect to urban versus rural population, the figures below show how this distribution has changed over the past years in SKN.

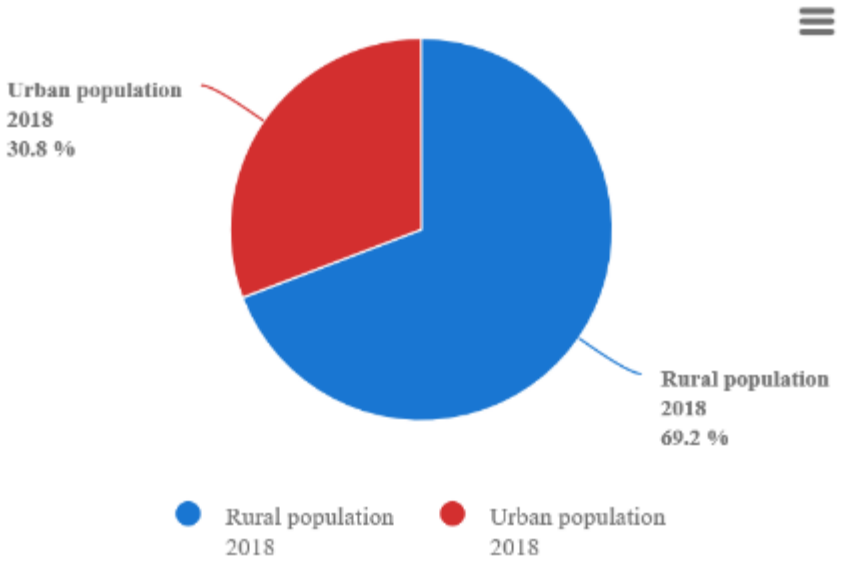


Source: FAO[27]

Figure 5-23. Evolution of Urban vs Rural Population in SKN (1990-2018)

[26] The Commonwealth, St. Kitts and Nevis Country Information, accessed at https://thecommonwealth.org/our-member-countries/st-kitts-and-nevis

[27] FAO Statistics, accessed at http://www.fao.org/faostat/en/#country/188



Source: FAO[28]

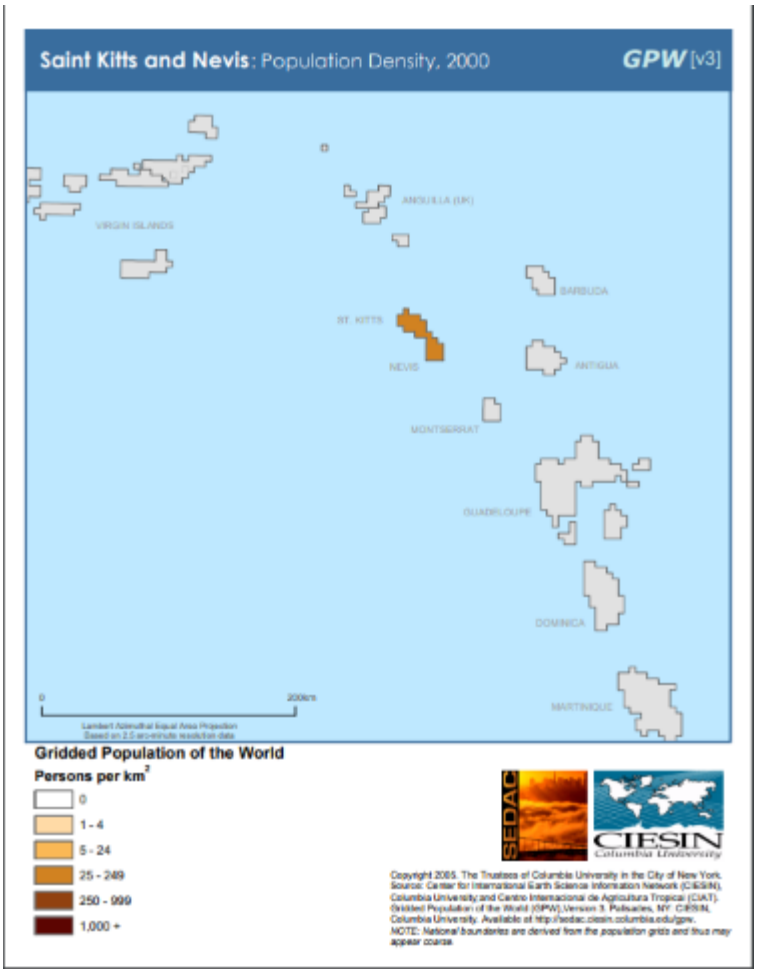
Figure 5-24. Urban vs Rural Population in SKN (2018)

Although these figures show that SKN is largely more rural than urban, with the rural population increasing in recent years, the ADI represents one of the most urban regions on Nevis, as the parish of St. Paul accounts for 15% of the country's population (UNESCO). Therefore, the ADI is slightly different that the Nevis-wide context when it comes to areas of residence.

5.4.2.3 Population Density

The population density for SKN overall is 202 people per km^2 in 2018, according to data from the World Bank.[29] The population density for Nevis is 123 persons per km^2, based on 2011 data.[30]

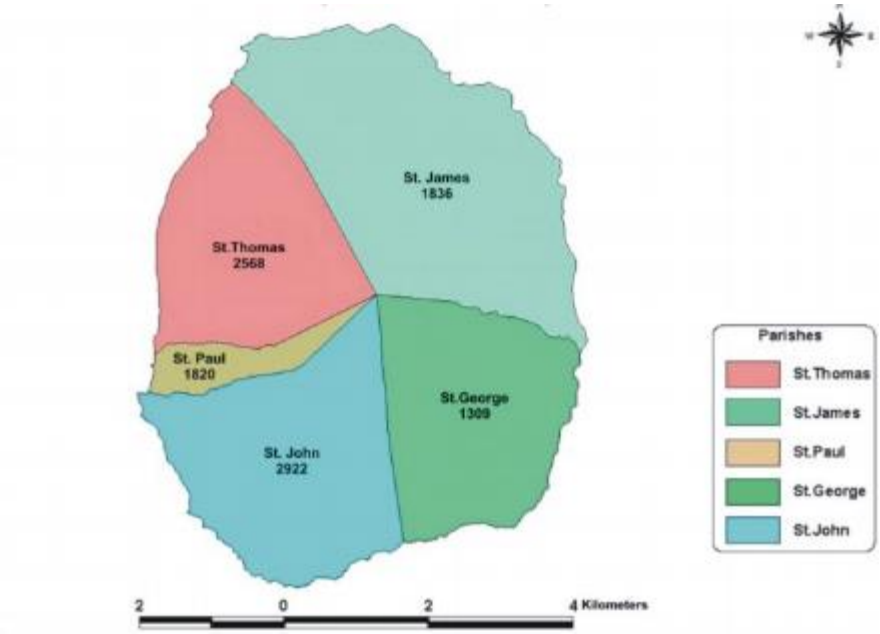
[28] FAO Statistics, accessed at http://www.fao.org/faostat/en/#country/188
[29] World Bank St. Kitts and Nevis data, accessed at: https://data.worldbank.org/indicator/EN.POP.DNST?end=2018&locations=KN&start=1961&view=chart
[30] The Commonwealth, St. Kitts and Nevis Country Information, accessed at https://thecommonwealth.org/our-member-countries/st-kitts-and-nevis



Source: Center for International Earth Science Information Network (CIESIN)

Figure 5-25. Population Density of St Kitts and Nevis (2000)

The figure below shows population distribution per parish in Nevis. It is important to note that Charlestown's population spans across the St. Thomas, St. Paul and St. John parishes.



Source: CDB Strategy and Action Plan

Figure 5-26. Population Distribution Map for Nevis (2001)

Charlestown, which is within the ADI, is the biggest urban center in the island of Nevis, which means it has the highest population density of the island, with approximately 1,401 people per km^2.

Table 5-12. Population Density in the ADI

City	Population 2009/2010	Geographic Area*	Density people/km^2
Charlestown	2,200	1.57km^2	1,401

Source: The Commonwealth, St. Kitts and Nevis Country Information, accessed at https://thecommonwealth.org/our-member-countries/st-kitts-and-nevis, 2009

*Source: ERM GIS Team

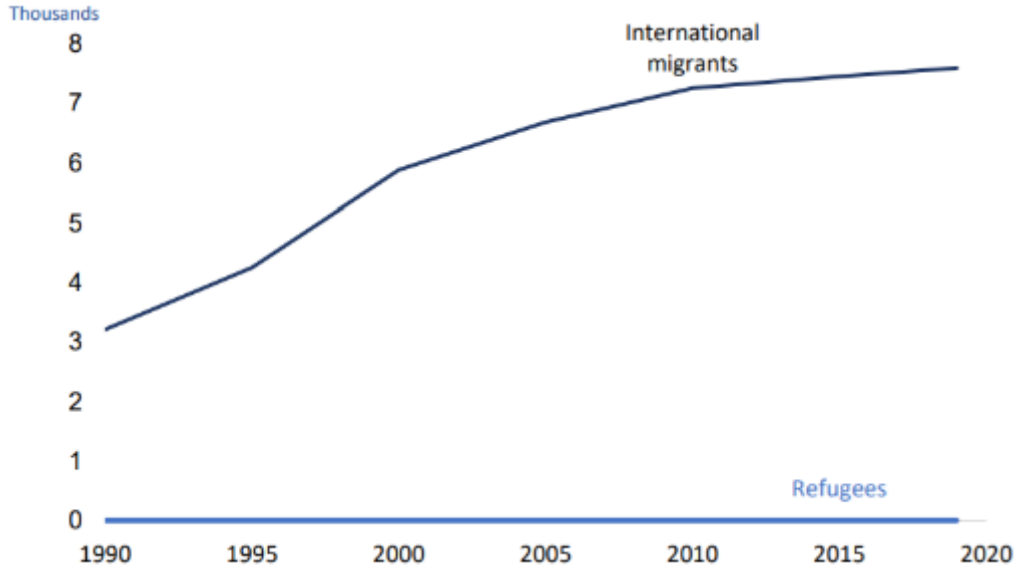
5.4.2.4 Migration

With regard to historical emigration, during the first quarter of the 21st Century, Nevisians emigrated to the United States, with sizeable Nevisian communities in New York and New Haven (Richard Frucht, Emigration, Remittances and Social Change: Aspects of the Social Field of Nevis, West Indies (1968)). During WWII, Nevisians emigrated to Aruba and Curacao for work, returning after the war (Frucht, 1968). Through the mid-fifties to the late sixties, emigration continued at a lower rate, composed primarily of unskilled young adults from working class households (Frucht, 1968).

Nowadays, the CARICOM Single Market and Economy allows free movement of selected categories of highly qualified nationals within the CARICOM region. In general terms, UNICEF estimated the net

migration rate for SKN at zero for 2010-2015[31], with the International Data Base for the US Census estimating a rate of 1 migrant/1,000 people for 2020[32].

The Figure below shows the increase in international migrants in SKN over the past two decades.



Source: UN Department of Economic and Social Affairs (DESA)[33]

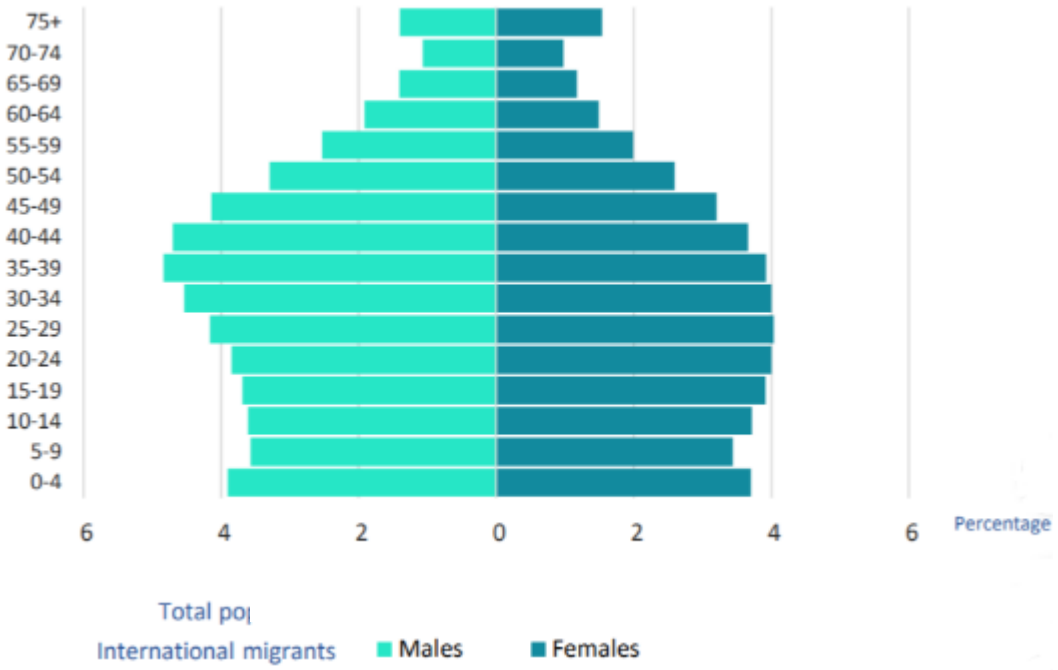
Figure 5-27. Percentage of Migrants in SKN (1990-2020)

While migration has grown in SKN, there are still under 8,000 migrants in both St. Kitts and Nevis. The Figure below shows the gender and age distribution of migrants in 2019 for SKN, as a percentage of the population.

[31] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

[32] United States Census, Demographic Overview St. Kitts and Nevis, accessed at; https://www.census.gov/data-tools/demo/idb/region.php?T=13&RT=0&A=both&Y=2016,2017,2018,2019,2020&C=SC&R=0

[33] UN DESA Country Profile, accessed at https://www.un.org/en/development/desa/population/migration/data/estimates2/countryprofiles.asp



Source: UN DESA[34]

Figure 5-28. Percentage of Migrants in SKN by Age and Gender (2019)

UNICEF reported that, in 2013, there were 5,673 migrants in SKN and, as of the end of 2012, there were zero refugees. According to UN DESA, as of 2019 this number had grown to 7,600 international migrants and but stayed at zero refugees. In 2013, the top five countries or areas of origin for migrants in SKN were the USA, Guyana, Dominic Republic, US Virgin Islands and Great Britain, in descending order (UNICEF). However, in 2019 this had changed slightly, with Guyana coming in first, followed by the US Virgin Islands, Montserrat, Antigua and Barbuda, and Trinidad and Tobago (UN DESA).

In 2019, there were reports about the Government of SKN repatriating Haitian migrants.[35] The Government held discussions with the United Nation's International Organization for Migration, CARICOM's Secretary General, and local arms of the Red Cross and the Haitian Association.[36] On October 20, 2019, police and immigration officials detained 15 of the 49 migrants that were repatriated, after they arrived by boat and attempted to check into a hotel without first clearing Immigrations and Customs.[37] Later in the week, the St. Kitts and Nevis Coast Guard assisted 34 Haitian migrants after their boat was reportedly in distress, taking

[34] UN DESA Country Profile, accessed at https://www.un.org/en/development/desa/population/migration/data/estimates2/countryprofiles.asp

[35] WIC News, St. Kitts-Nevis Government Repatriates 49 Haitian Migrants (2019), accessed at https://wicnews.com/caribbean/saint-kitts-nevis/st-kitts-nevis-government-repatriates-49-haitian-migrants-050423024/

[36] WIC News, St. Kitts-Nevis Government Repatriates 49 Haitian Migrants (2019), accessed at https://wicnews.com/caribbean/saint-kitts-nevis/st-kitts-nevis-government-repatriates-49-haitian-migrants-050423024/

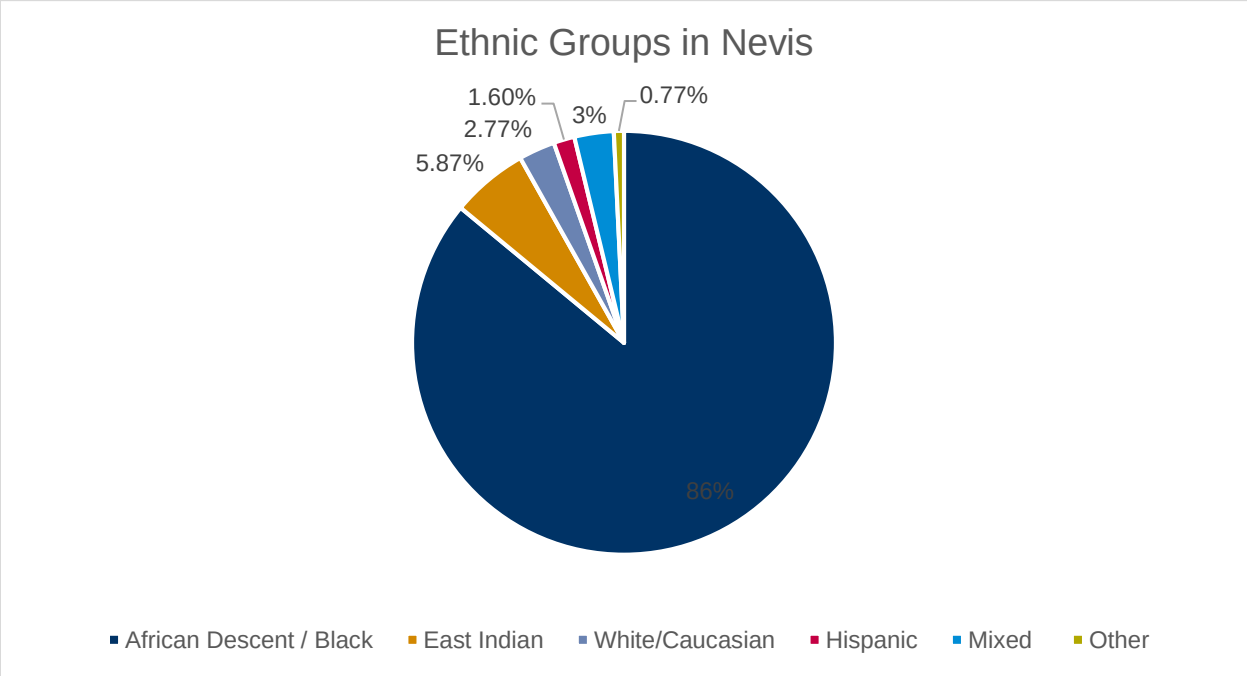
[37] WIC News, St. Kitts-Nevis Government Repatriates 49 Haitian Migrants (2019), accessed at https://wicnews.com/caribbean/saint-kitts-nevis/st-kitts-nevis-government-repatriates-49-haitian-migrants-050423024/

them to Basseterre.[38] All 49 migrants have been repatriated to Haiti and the local police forces are investigating the circumstances surrounding the migrants' entry into the country.[39]

According to the 2011 census, compared to the 2001 census, there have been marginal population increases (31%) in urban parishes in both St. Kitts and Nevis. With respect to the ADI, Nevis has experienced a rise in the number of housing projects in the parish of St. Paul, which has led to an increase by one-third in the population there.[40] The context provided above can be considered representative for the ADI. The low rates of migration for Nevis and the ADI should be taken into account when planning for an influx of Project-related labor. For more information on Project employment, see Section 5.4.3.3.

5.4.2.5 Ethnic Groups or Indigenous Peoples

According to data from the St. Kitts Statistics Department, in 2013, 94% of the population was of Afro-Caribbean descent, 2.74% identified as "mixed", 1.6% were East Indian, 1% were white/Caucasian, 0.38% were Amerindian/Carib, and 0.2% identified as "other" (The Culture of St. Kitts and Nevis, The Journal of Race & Policy (2013)). For Nevis, specifically, the Figure below shows the breakdown of ethnicities per the 2011 Census. The "other" category is comprised of 0.29% Chinese; 0.02% Indigenous People; 0.03% Portuguese; 0.07% Syrian/Lebanese; and 0.36% other or not stated (Nevis Statistical Digest, 2018).



Source: Nevis Statistical Digest, 2018

Figure 5-29. Ethnic Groups in Nevis (2011)

While there are no data disaggregated to the Charlestown or parish levels on ethnic groups or indigenous people, the information provided above can be considered representative for the ADI.

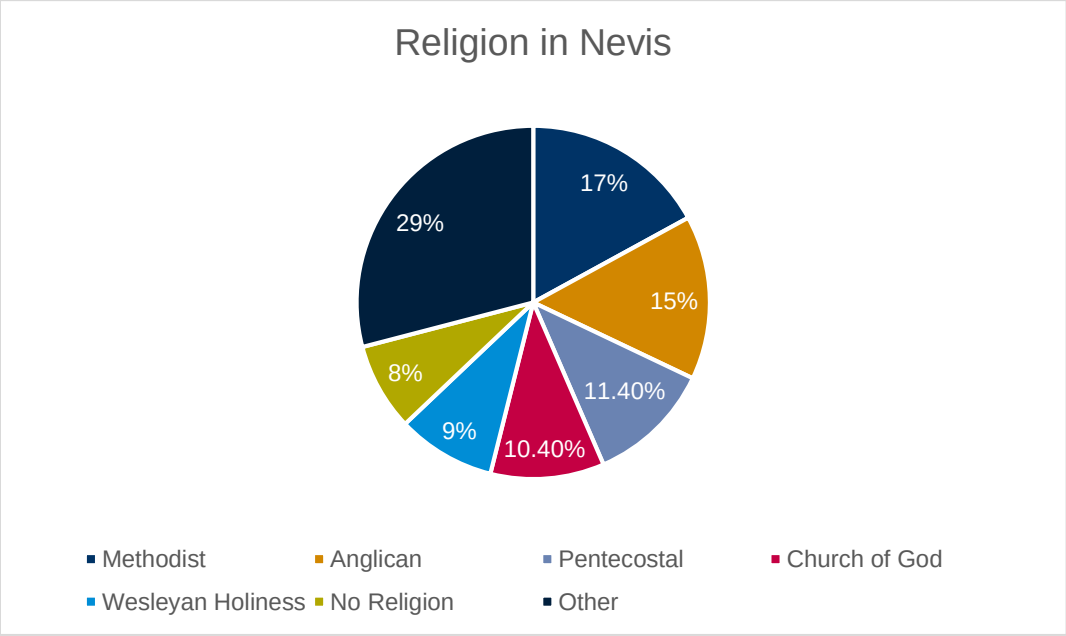
[38] WIC News, St. Kitts-Nevis Government Repatriates 49 Haitian Migrants (2019), accessed at https://wicnews.com/caribbean/saint-kitts-nevis/st-kitts-nevis-government-repatriates-49-haitian-migrants-050423024/

[39] WIC News, St. Kitts-Nevis Government Repatriates 49 Haitian Migrants (2019), accessed at https://wicnews.com/caribbean/saint-kitts-nevis/st-kitts-nevis-government-repatriates-49-haitian-migrants-050423024/

[40] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

5.4.2.6 Religion

According to the Nevis Statistical Digest (2018), one of the most important elements of the people of Nevis is their religious beliefs, which are traditionally founded on Christianity. Nevisians embrace Christian beliefs as taught by several denominations in the society, and traditionally, there were Anglican, Roman Catholic, Methodist, Baptist and Wesleyan Holiness churches. In recent times, others have been added including: Church of God, Brethren, Evangelical, Pentecostal, Seventh Day Adventist and Jehovah's Witness. From about the mid-1990s, with the influx of immigrants from other Caribbean countries, Nevis has also witnessed the practice of religious beliefs in Hindu, Bahai and Muslim traditions (Nevis Statistical Digest, 2018). The Figure below shows Nevis data per the 2011 Census. Religions identified in the 2011 Census and represented in the "Other" category below include Hindu, Jehovah's Witness, Rastafarian, Catholic, Seventh Day Adventist, Bahai, Baptist, Evangelical, Presbyterian and Muslim (Nevis Statistical Digest, 2018).



Source: Nevis Statistical Digest, 2018

Figure 5-30. Religious Groups in Nevis (2011)

There are no data on religion disaggregated to the Charlestown or parish levels. However, the context provided above can be considered representative for the ADI.

5.4.2.7 Education

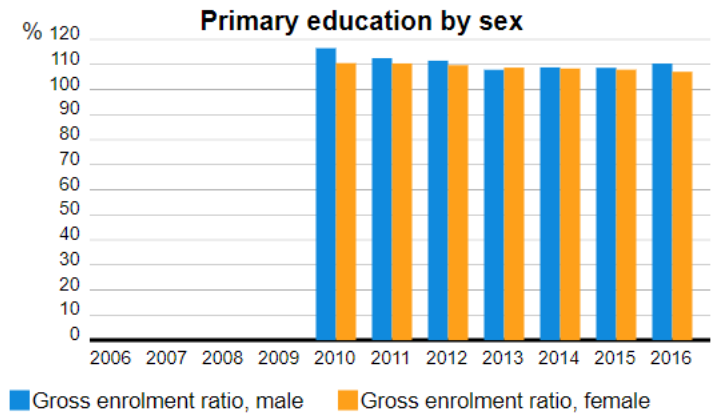
The government aims to transform SKN into a highly trained "information society" (Government of St. Kitts and Nevis, 2006). Universal education is free through the secondary level, and children must attend school until age 16 (UNESCO, 2008). Nevisians can obtain tertiary education at the Sixth Form College on Nevis or overseas with the assistance of government scholarships (PAHO, 2008).

The literacy rate in the country is 97.4% for females and 96.5% for males in the 15-24 year age group.[41] Enrolment rates are a key indicator to assess the coverage of the education system and the reduction of

[41] Caribbean Development Bank. Country Gender Assessment: St. Kitts and Nevis (vol 1). St. Michael, Barbados: CDB; 2014. Accessed at: http://www.caribank.org/uploads/2014/12/CGA-St-Kitts-Nevis_Vol-I_JULY2014_FINAL.pdf.

gaps in access to education in a country. As of 2017, there were seven public primary schools, three private primary schools in Nevis, two public secondary schools and one private secondary school (Nevis Statistical Digest, 2018). In 2017, the public primary schools counted 1,009 students and 121 teachers, while private primary schools counted 174 students and 22 teachers (Nevis Statistical Digest, 2018). The public secondary schools counted 901 students and 140 teachers in 2017, while the private secondary school counted 33 students and 13 teachers in 2016 (no data was available for 2017) (Nevis Statistical Digest, 2018). There are also multiple nurseries and preschools in Nevis, such as the Charlestown Pre-School or the Stepping Stone Nursery.[42]

Net enrollment in primary school for 2016, according to UNESCO data, was 93.79%, with females attending at slightly lower rates than males.

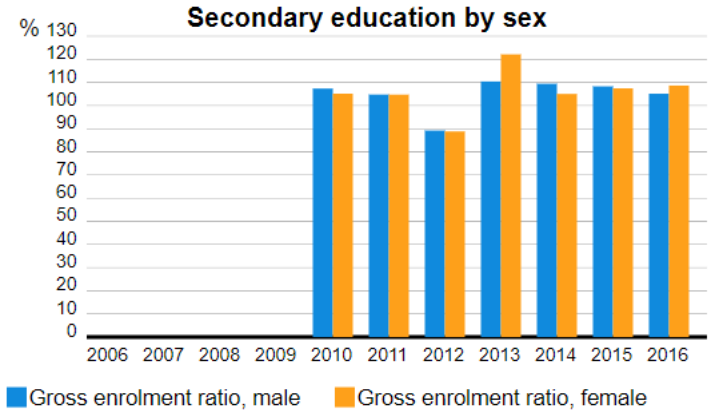


Source: UNESCO

Figure 5-31. Primary Education by Sex

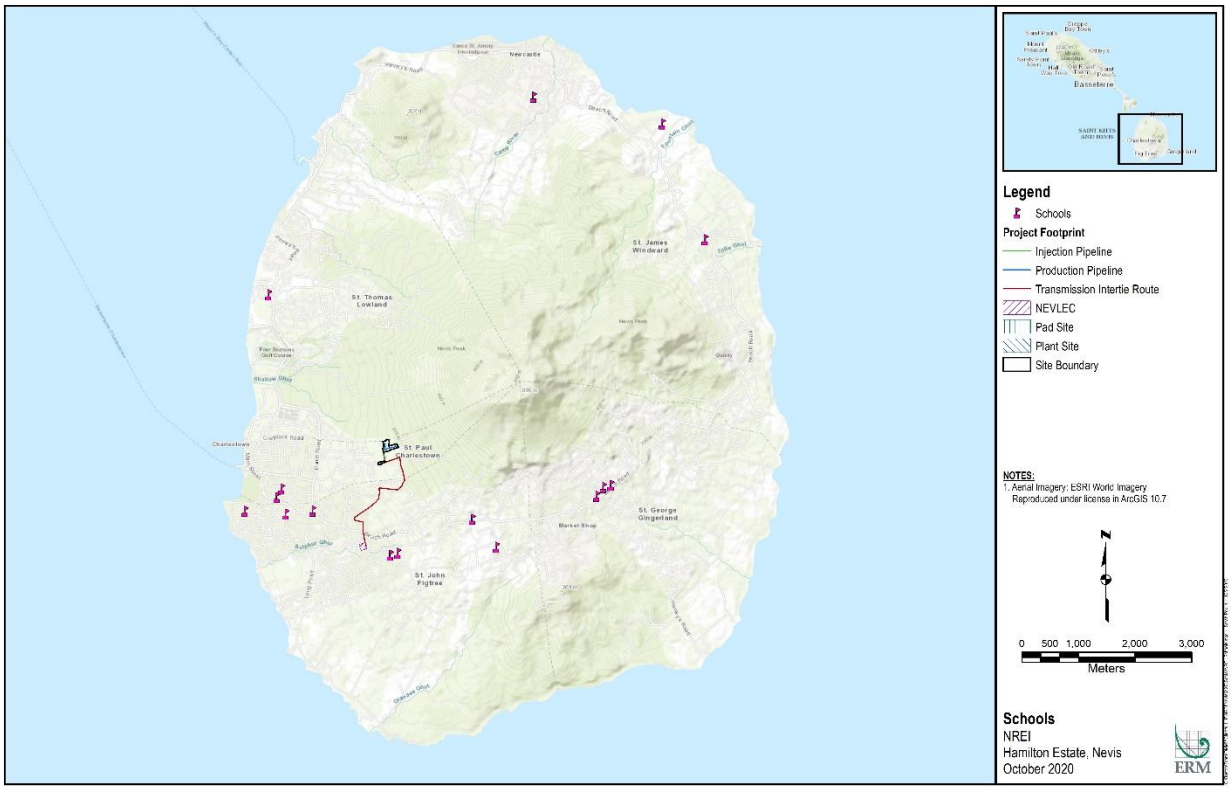
The secondary school enrolment rate for the country was 98%, with a higher rate for females (99.7%) than males (96.27%), per UNESCO's 2016 data.

[42] HumData, Nevis Schools, accessed at: https://data.humdata.org/dataset/hotosm-saint-kitts-and-nevis



Source: UNESCO

Figure 5-32. Secondary Education by Sex



Source: ERM, 2020

Figure 5-33. Educational Institutions in Nevis

5.4.2.8 Education in ADI

In addition to the island-level context provided above on education, in 2017 there were 566 students enrolled in Charlestown Sixth Form College (tertiary education), and 176 in Charlestown and Gingerland secondary schools. Of the students in Charlestown's Sixth Form College, 473, or 84%, obtained passing grades during the 2017 school year (Nevis Statistical Digest, 2018).

5.4.3 Socioeconomic Aspects and Livelihoods

5.4.3.1 Poverty and Development Indicators

The World Bank defines the extreme global poverty line to be about US$ 1.90 per day per person. Apart from monetizing aspects such as access to clean water and access to health care, there is a legitimate debate about the multidimensional aspects of poverty, such as a sense of dignity and having a job. According to the World Bank, beyond economic growth, education systems and effective social safety nets are key to keeping people out of poverty.[43]

According to the 2007–2008 Poverty Assessment Survey, the prevalence of poverty in 2008 was 22% compared to 32% in 2002, with indigence declining from 11% to 1%. Of the poor, 52.2% were women and 47.8% were men. Females are more likely than males to be among the indigent in St. Kitts, but in Nevis, men accounted for more of the non-indigent poor and vulnerable.[44] The Country Poverty Assessment developed in 2007 revealed a national poverty rate of 21.8 in SKN.

Another indicator for measuring poverty and development is the Human Development Index (HDI). Proposed by UNDP in 1990, the HDI is used to measure the level of development of a society based on the best available citizens to achieve the best possible quality of life.[45]

In the report prepared by UNDP for the year 2018, SKN occupies position 73 of the 189 participating countries, with an HDI of 0.777, defined as the high human development category. This evaluation includes indicators such as: long and healthy life, decent standard of living and access to knowledge. According to the socio-economic information collected for the UNDP report, the country's development conditions are higher than the average for countries in the high human development area and above the average for countries in Latin America and the Caribbean. There is no HDI information at the departmental or municipal level for SKN.

The Nevis Statistical Digest (2018) states that Nevis has grappled with some level of poverty in society and related problems for decades and thus anti-poverty strategies and social programs have been implemented. Social Assistance can be in either cash or in-kind, and are transferred to vulnerable individuals or households with no other means of adequate support, including single parents, the homeless, or the physically or mentally challenged. These programs include but are not limited to hot meals program, food vouchers, baby sitter assistance, elderly day care, bus passes for the elderly, assistance to victims of domestic abuse and child protection (Nevis Statistical Digest, 2018).

In the 2007-08 CPA, the ADI's St. Paul and St. John parishes ranked second and fourth for poverty distribution by parish, respectively.

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[43] The World Bank, Ending Extreme Poverty (2016), accessed at https://www.worldbank.org/en/news/feature/2016/06/08/ending-extreme-poverty

[44] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

[45] In 2010, UNDP determined a new methodology for measuring HDI. This considers the following levels of analysis:
Extension of a long and healthy life, measured by life expectancy at birth.
Level of education, measured from the adult population rate with complete high-school education as well as the number of years of education the population over 25 years of age has.
Access to assets and resources, measured by household income per capita.

Table 5-13. Distribution of Poor by Parish

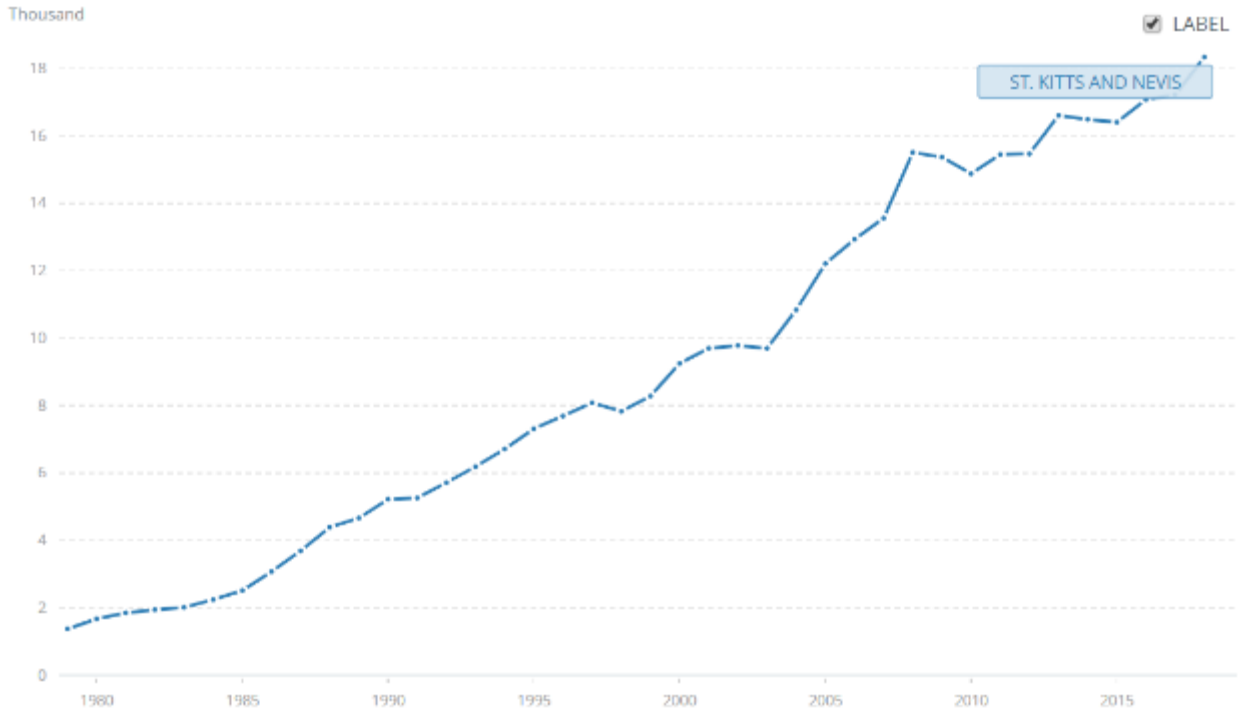
Parish	St. Paul	St. John	St. Thomas	St. George	St. James	Total
Poor	16.20	39.3	16.5	19.7	8.3	100%

Source: CPA 2007-08

In 2017, the Social Services Department of Nevis reported that 11 people were enrolled in hot meals programs in the St. Paul parish, and 13 in the St. John parish, from 69 registered people on the island, constituting 16% and 19% of the total, respectively.

5.4.3.2 Macro-Economic Indicators

According to the World Bank, as of 2018, the Gross Domestic Product (GDP) of SKN was 1.011 billion (current US$) or $18,340 per capita. The Figure below shows GDP per capita since 1980. The United Nations considers SKN to be a high-income developing country.



Source: World Bank

Figure 5-34. GDP per Capita

More information on main industry sectors and SKN's economic transition in recent years is provided in Section 5.4.3.4.

5.4.3.3 Employment

According to data from the CDB's 2018 Economic Brief for St. Kitts and Nevis, the introduction of the People Employment Programme in 2012 (two years ago renamed and reorganized as the "Skills Training and Empowerment Programme" (STEP)), has lowered unemployment significantly. No official unemployment data have been published since 2009, but according to the Government of SKN, the STEP still employed 2,000 persons as of February 2018, giving major relief to the labor market. While the islands do not collect employment data on a systematic basis, an employment survey conducted as part of the 2007-08 Country Poverty Assessment showed an unemployment rate of 5.1%.[46] Since then, the construction, manufacturing, hotel and restaurant sectors have experienced a downturn in economic activity, leading to increased unemployment. The last employment survey, undertaken in 2009, showed an increase to the rate of unemployment to 6.5%, with high rates of youth unemployment: 22.9% of those aged 15-19 and 12% of those aged 20-24 were unemployed (CDB's Country Strategy Paper 2013-2016).

The CDB's Country Strategy Paper 2013-2016 describes the country's economy as follows: "The economy of SKN is small and open and has undergone significant structural change over the last three decades. With agriculture and manufacturing declining in relative importance, tourism has grown to become the main source of employment and foreign exchange earnings, accompanied by a rapid expansion of the banking and construction sectors. In addition, SKN has also diversified into offshore education and financial services. As a result, the economy is now mainly service-based with tourism estimated to have contributed 28.2% of GDP in 2011".

Employment in ADI

The Nevis Statistical Digest (2018) indicates that there are 1,104 people of working age in the St. Paul parish, and 2,616 in St. John. Of these, 1,787 are male and 1,933 are female. The unemployment rate in St. Paul for males is 6.5% and for females is 6.3%, which is higher than the Nevis average of 4.4% and 3.6% respectively (Nevis Statistical Digest, 2018). However, in St. John, the unemployment rate for males is 3% and for females it is 1.8%, lower than the Nevis average.

According to interviews conducted with NREI personnel, during the construction phase, the Project will be employing approximately 80 people, a majority of which will be local. This will be in addition to truckers and heavy equipment operators, who will also be hired locally. There will likely also be indirect jobs created in local restaurants and businesses as a result of the Project. The Project will ultimately create 17 permanent job posts.

5.4.3.4 Main Industry Sectors

Traditionally, the sugar industry, nationalized in 1975, dominated the economies of SKN, but it closed in 2005 after declining for decades (Avameg, 2010). Today, construction, government services, manufacturing, banks and insurance make the largest contribution to the GDP, and tourism is the largest foreign exchange earner.

The latest data on the distribution of the economically active population (EAP) for Nevis, provided by the Social Security Board for 2010, reflects a higher level of employment of the EAP in Public Administration and Defence (1,654 employees), Hotels and Restaurants (1,333 employees), and Construction (1,240 employees). All other sectors have fewer than 500 employees. For a detailed breakdown, please see the Table below.

[46] Country Poverty Assessment (CPA), accessed at https://www.stats.gov.kn/wp-content/uploads/2019/07/St.Kitts-and-Nevis-CPA-Vol.1-Final-Report-2008.pdf

Table 5-14. Active Employers and Employees by Industry

	Employers			Employees		
Industry	**2008**	**2009**	**2010**	**2008**	**2009**	**2010**
Agriculture, Hunting & Forestry	30	30	28	109	110	96
Fishing	2	2	2	6	4	5
Mining & Quarrying	0	0	1	0	1	1
Manufacturing	43	39	40	208	182	234
Electricity, Gas & Water Supply	5	5	5	125	117	108
Construction	162	169	153	1,307	1,401	1,240
Wholesale & Retail Trade	98	88	88	745	677	754
Hotels & Restaurants	69	67	70	1,614	1,509	1,333
Transport, Storage & Communications	31	29	31	473	487	471
Financial Intermediation	28	27	29	281	260	253
Real Estate, Renting & Business Activities	63	60	60	326	251	263
Public Administration & Defence	2	2	2	1,517	1,501	1,654
Education	12	11	12	152	189	164
Health & Social Work	11	13	12	49	48	47
Other Community, Social & Personal Services	35	34	33	158	141	133
Private Household with Employed Persons	140	138	138	218	216	218
Total	731	714	704	7,288	7,094	6,974

Source: Social Security Board Statistics Digest 2008-2010

Tourism

According to the Nevis Statistical Digest (2018), tourism is the most vital industry in the Nevisian economy. There is a choice of accommodation on Nevis ranging from luxury hotels, colonial style inns, and villas to secluded inns and bed and breakfasts. Yacht and cruise tourism plays a major role for Nevis, with most cruise calls during the period of November to April (Nevis Statistical Digest, 2018). In 2017, cruises brought in 9,706 visitors and yachts brought in 3,027 visitors (Nevis Statistical Digest). As of 2017, there were seven hotels in Nevis, with 356 rooms and 552 beds (Nevis Statistical Digest, 2018). During 2017, Nevis received 7,014 visitors, most of which came during the tourist season of September to April (Nevis Statistical Digest, 2018). The vast majority of the visitors came from the USA and the Caribbean, with European and Canadian tourists coming in third and fourth (Nevis Statistical Digest, 2018). Most visitors to Nevis stayed between four and seven days, but notably about 20% stayed for over 15 days (Nevis Statistical Digest, 2018). A majority of visitors declared the purpose of their visit to be a vacation (63%), with other leading purposes being business, medical reasons, and study (Nevis Statistical Digest, 2018).

On Nevis, The Four Seasons Resort is the largest employer[47] and accounts for approximately $2 to $3 million dollars annually just in payroll.[48] It employs about a fifth of the population directly and 35 to 40 percent indirectly (EIA). As of August 2019, it was reported that The Four Seasons was undergoing construction work to renovate rooms and had temporarily laid off about 361 workers, paying them 25% of their salaries and maintaining their medical benefits and other benefits during the temporary closure.[49] According to the Voice of Nevis, during the COVID-19 pandemic, The Four Seasons Resort continued to pay its workers 100% of their salaries for the months of April and May despite the closure.[50]

[47] CDB's Country Gender Assessment, 2014

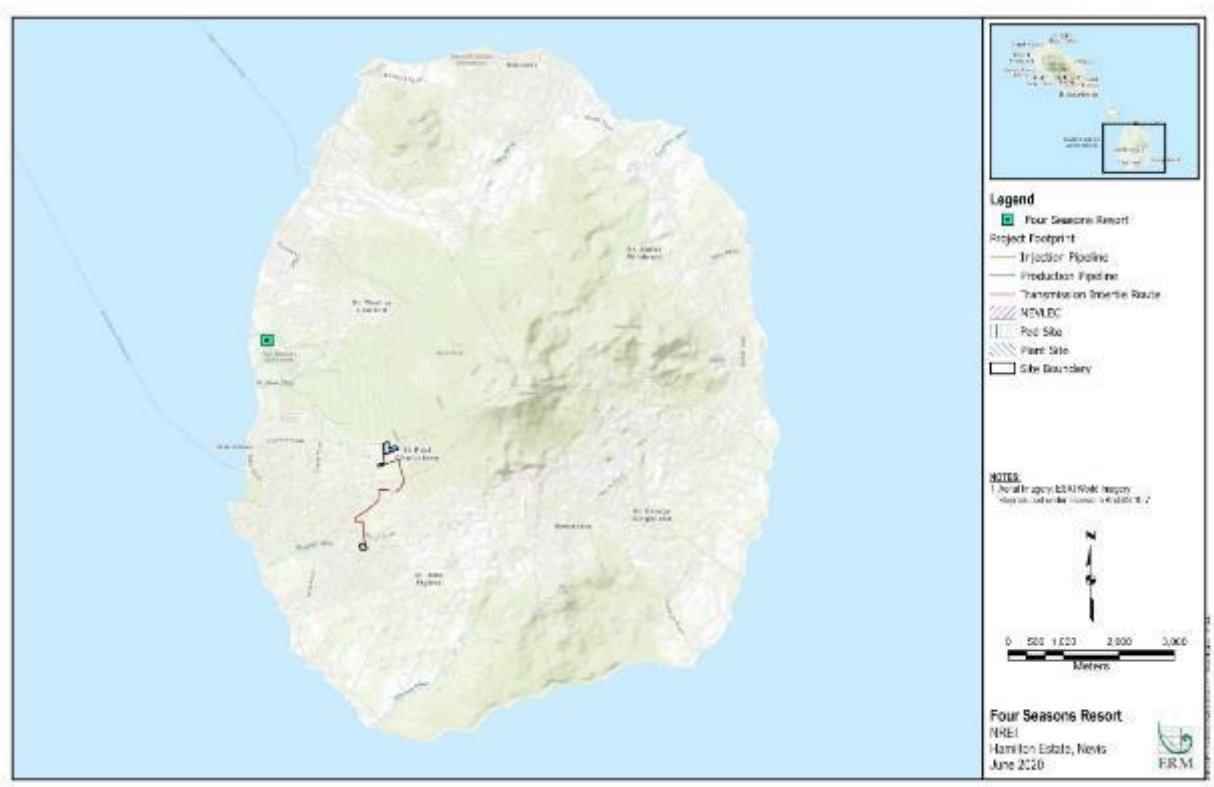
[48] International Monetary Fund, Staff Country Reports (2009), accessed at https://books.google.com/books?id=RtPXbtbR8CMC&pg=PA11&lpg=PA11&dq=largest+employer+nevis&source=bl&ots=s9Tris9_Y1&sig=ACfU3U2HqJENAaKuC_lO6N5bAq0DVfTW6g&hl=en&sa=X&ved=2ahUKEwiH79nYtvrpAhUkTDABHReMBO8Q6AEwDXoECAkQAQ#v=onepage&q&f=false and Sun Sentinel, Nevis Build Its First Resort (1992), accessed at https://www.sun-sentinel.com/news/fl-xpm-1992-01-19-9201040028-story.html

[49] Travel Pulse, Nevis Aids Four Seasons Resort Workers During Closure (2019), accessed at https://www.travelpulse.com/news/hotels-and-resorts/nevis-aids-four-seasons-resort-workers-during-closure.html

[50] VON, CoVID-19: Four Seasons Resort continue to pay workers 100 % of their wages, 2020 accessed at https://vonradio.com/covid-19-four-seasons-resort-continue-to-workers-100-of-wages/

Source: Four Seasons Resort

Figure 5-35. Four Seasons Resort in Nevis



Source: ERM, 2020

Figure 5-36. Four Seasons Resort Location

In addition to The Four Seasons Resort, many smaller hotels, inns and recreational centers, including the Robert Trent Jones II Golf Course, also serve tourists. Tourist destinations are concentrated on the coastlines, particularly along the Western shore of the island at Pinney's Beach. In 2016, hotels and restaurants alone generated XCD 149.23 million, growing to XCD 150.71 million in 2017, for St. Kitts and Nevis (Nevis Statistical Digest, 2018). However, the effects of the COVID-19 pandemic in the local economy are set to be significant, with a 40% drop in tourism revenue forecasted for 2020 (Control Risks Country Profile). The Figure below shows the location of hotels around the Project site.

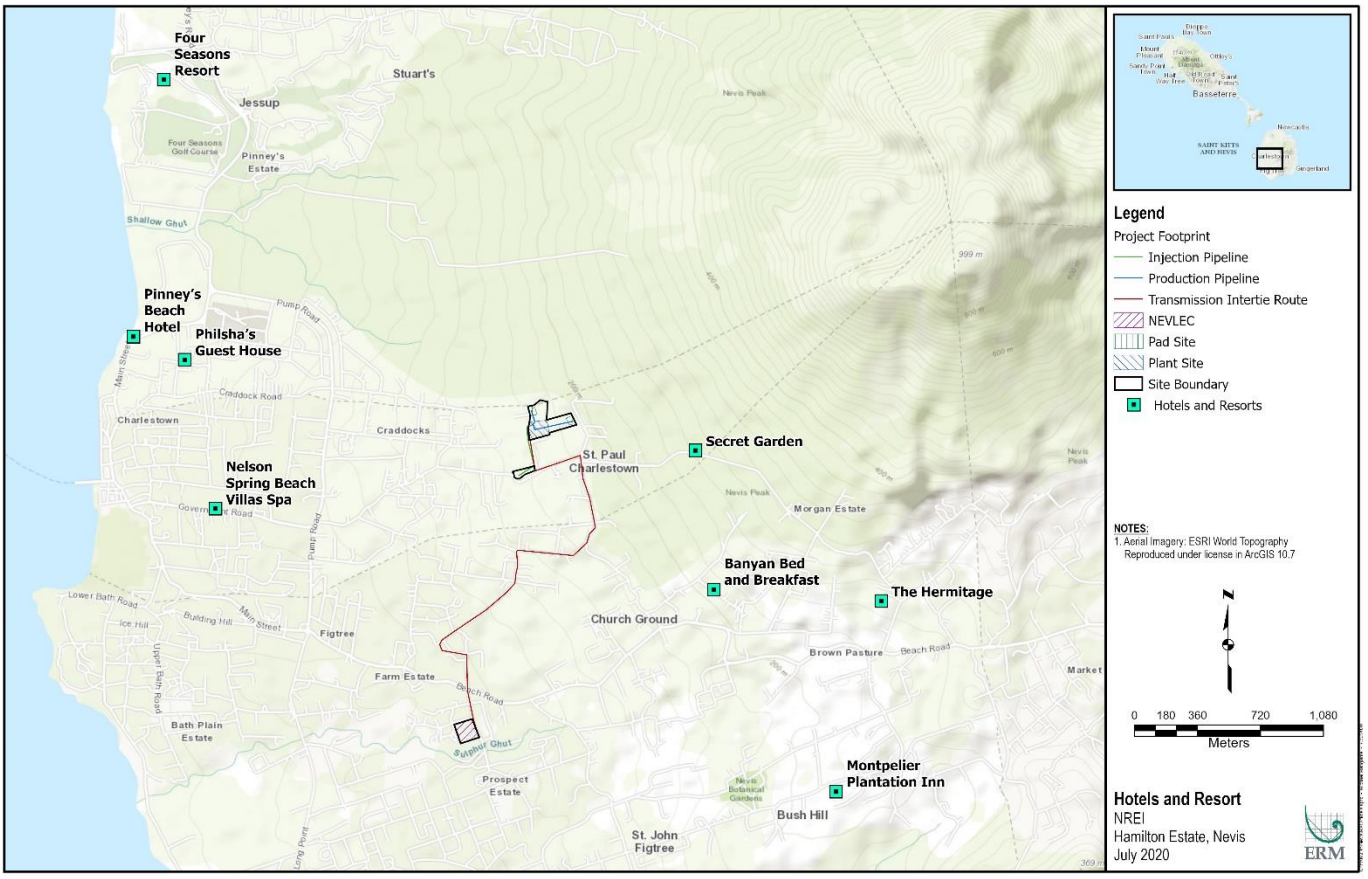


Figure 5-37. Location of Hotels and Resorts

With respect to the ADI, the Project is positioning itself as an opportunity for green and eco-tourism, with opportunities for the general public and tourists to tour the Project site and learn about geothermal energy, as there has been an increasing interest locally, regionally and internationally in renewable and geothermal energy (Interview with Mackie Tross, June 2020).

Construction

In 2016, the construction sector generated XCD 327.75 million in St. Kitts and Nevis, growing to an estimated XCD 357.37 million in 2017, constituting the strongest sector for Gross Domestic Product for both St. Kitts and Nevis (Nevis Statistical Digest, 2018). For Nevis, specifically, this sector is one of the largest employers, although work permit applications have gone down in recent years, as is shown on the table below.

Table 5-15. Work Permit Applications to Construction Sector

Sector	2010	2011	2012	2013	2014	2015	2016	2017
Construction	301	184	130	87	58	116	98	85

Source: Department of Labour, Nevis Statistical Digest, 2018

Public Administration and Defense

In 2016, the St. Kitts and Nevis Public Administration, Defense and Compulsory Social Security reported XCD 181.02 million in GDP, growing to an estimated XCD 186.71 million in 2017 (Nevis Statistical Digest, 2018). For Nevis, specifically, this sector is one of the largest employers, although work permit applications have gone down in recent years, as is shown on the table below.

Table 5-16. Work Permit Applications to Nevis Island Authority

Sector	2010	2011	2012	2013	2014	2015	2016	2017
Nevis Island Authority	148	133	90	69	67	65	30	36

Source: Department of Labour, Nevis Statistical Digest, 2018

The main industry sectors described above are the same for the ADI.

5.4.3.5 Port Activities in the ADI

The Nevis Air & Seaport Authority (NASPA) is responsible for regulating maritime shipping in Nevis, granting licenses for navigation operations and permits, and ensuring compliance with maritime safety conventions and regulations. NASPA operates three ports: Long Point Port, primarily a cargo facility; Charlestown Port, primarily serving passenger vessels and yachts; and Newcastle Seaport on the north side of Nevis, used primarily by local fishing vessels. A 2018 study found that Nevis ports received 317 ship calls in 2016, including 155 cargo vessels (dry cargo and tankers) 111 passenger and recreational vessels and 51 other vessels (RAC-REMPEITC 2017). The data are not divided among ports, but the cargo vessels are most likely to have used Long Point.

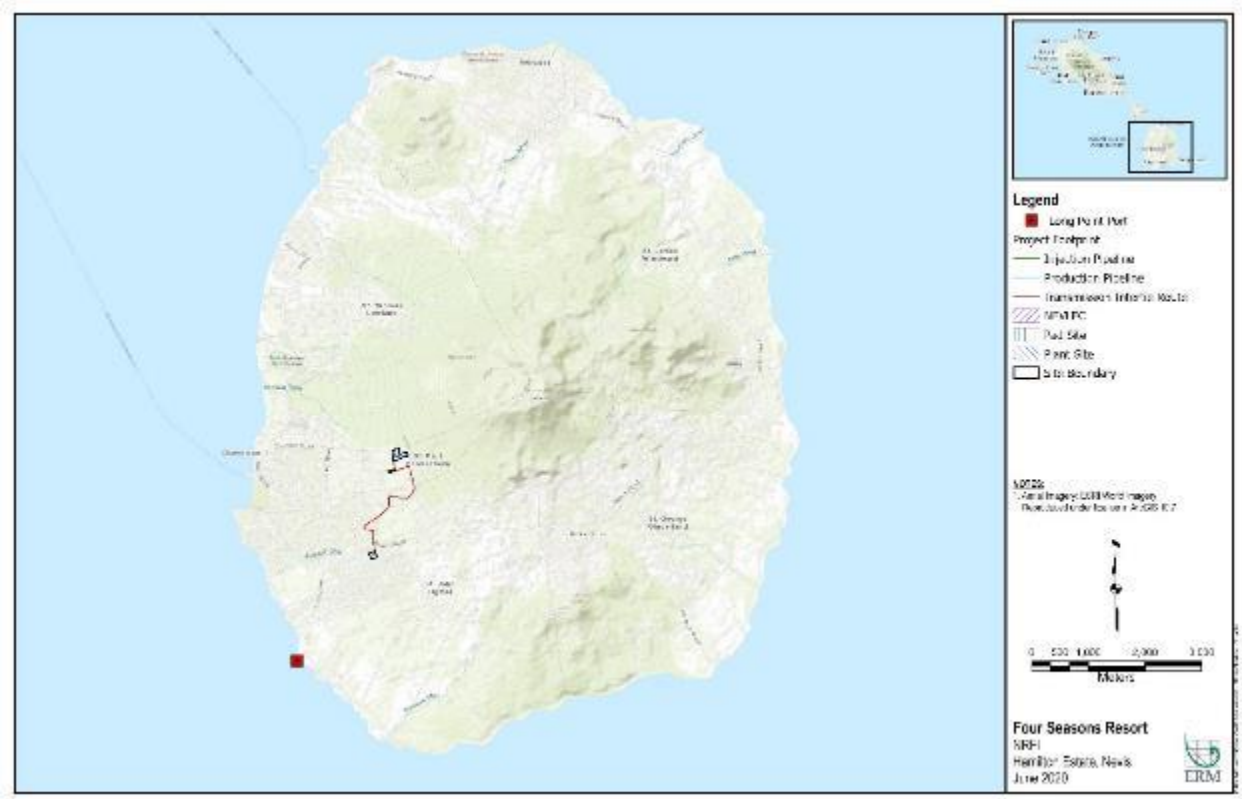
In 2017, there were 162,675 inter-island passenger arrivals and 154,471 inter-island passenger departures at Charlestown port (Nevis Air and Sea Ports Authority). In 2017 cargo activity into and out of Nevis ports (assumed to be almost entirely imports to Charlestown Port) included 29,905 tons of oil, 42,158 tons of sand and stone, 2,767 tons of vehicles, 4,311 tons of vegetables, and 49,406 tons of other materials (Nevis Air and Sea Ports Authority).

The Project will use Long Point Port to receive shipments for construction. Located on the southern coast of the island south of Charlestown, one mile from the main road, Long Point Port receives imports and houses Customs officials. The aim of the port is to maximize and accommodate the movement of cargo for domestic consumption and to enable and assist in exports. This port was completed in September 1999, in an area of undeveloped land that the government saw as a future industrial site. There is now demand for

land at Long Point, and a number of businesses have commenced operation in the vicinity of the port (NASPA). Long Point Port provides 24-hour security protection in line with the International Ship and Port Facility Security Code; reefer (refrigerated cargo) points for accommodating containerized cargo; excess space for ease of maneuvering containerized and break bulk cargo; an L-shaped jetty with a width of about 60 feet to allow for cargo movement on and off the vessel; and a low-tide berthing with a depth of up to 6.5 meters (NASPA 2020). The port has moderate activity and non-existent waiting times, with turnarounds being within acceptable standards (NASPA 2020). NASPA also provides a refueling service to yachters at the port. While temporary arrangements are being used at present, there are plans to construct a fuel facility to service various types of vessels (NASPA).

Source: NASPA, 2020

Figure 5-38. Long Point Cargo Facility



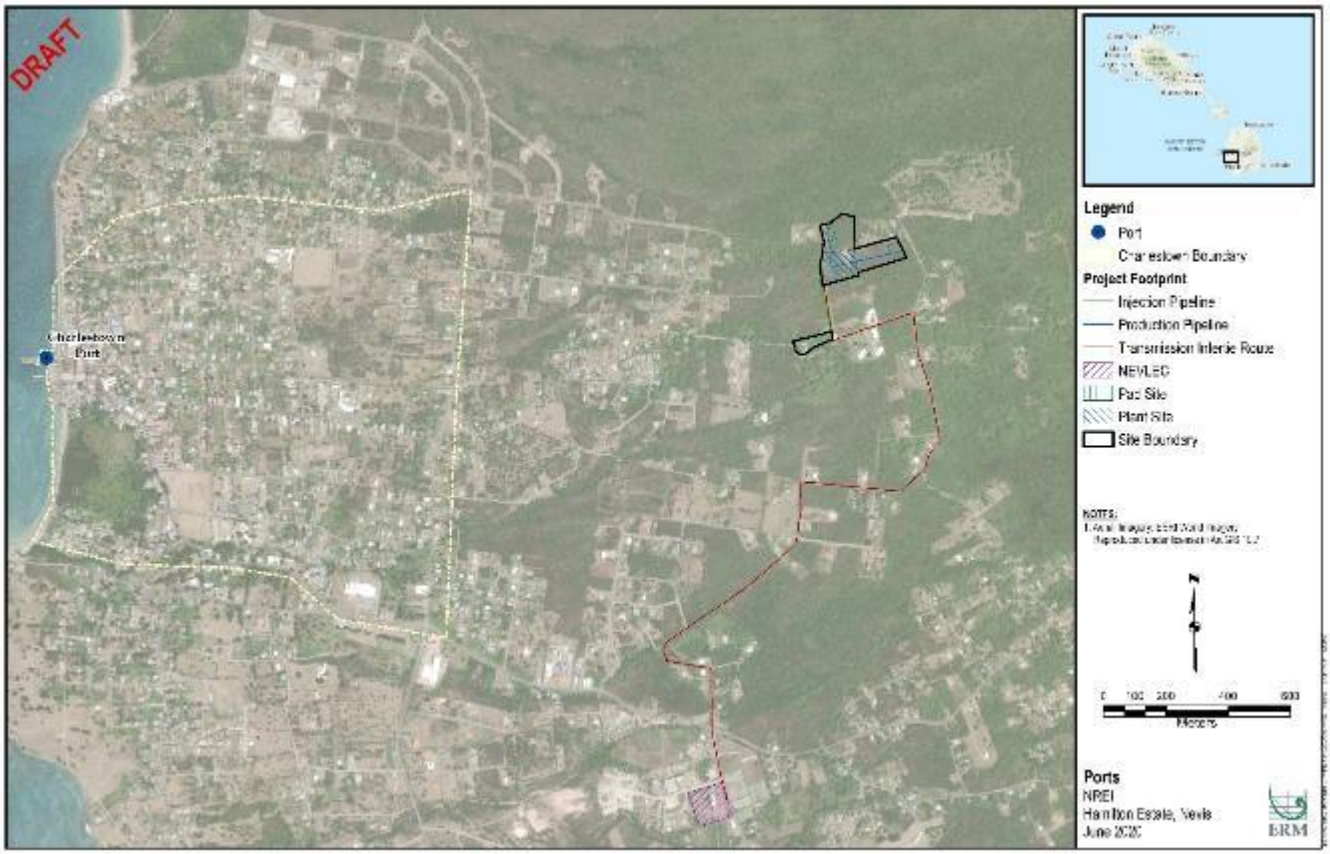
Source: ERM, 2020

Figure 5-39. Long Point Cargo Facility Location

The ADI also includes the Charlestown port, which is located in Charlestown and serves ferries, yachts, cruise ships and larger ships.[51] It has an anchorage and cargo pier depth of 7.1 – 9.1m.[52]

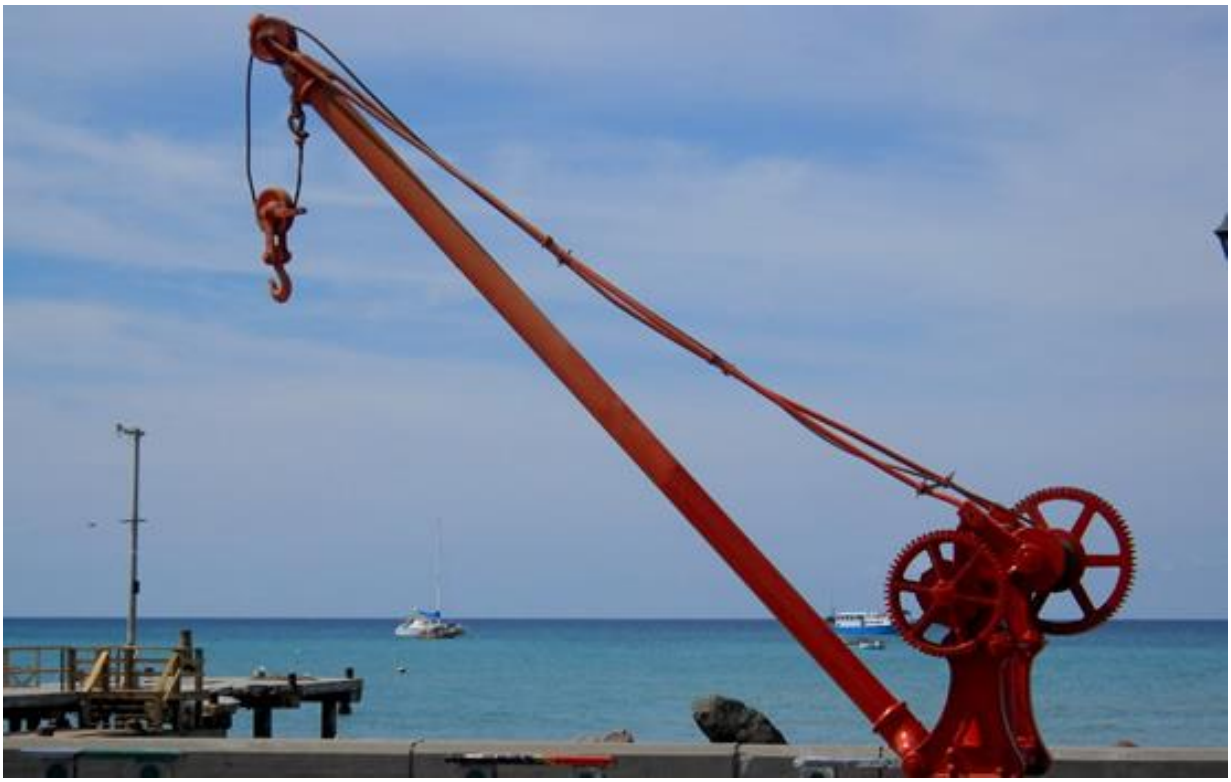
[51] NASPA, Charlestown Port, accessed at: http://www.nevisports.com/Page.asp?conid=50

[52] Ports.com, Port of Charlestown, St. Kitts and Nevis, accessed at: http://ports.com/saint-kitts-and-nevis/port-of-charlestown/



Source: ERM, 2020

Figure 5-40. Location of Charlestown Port



Source: NASPA, 2020

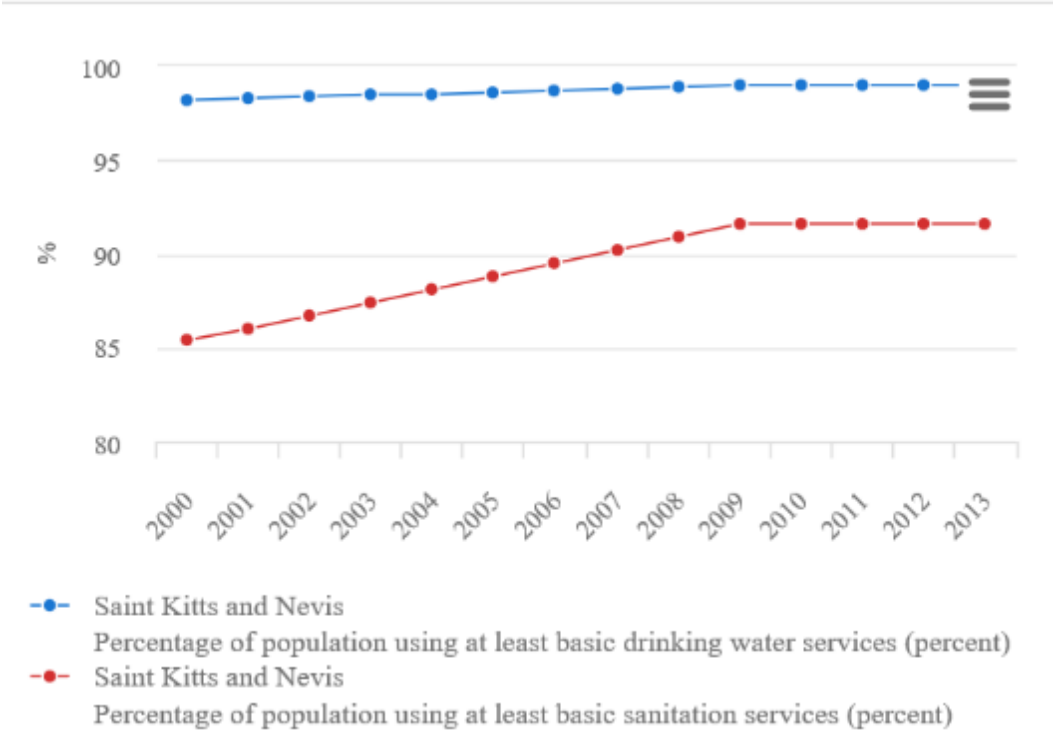
Figure 5-41. Charlestown Port

5.4.4 Social Infrastructure and Public Services

5.4.4.1 Water

The Nexus Commonwealth Network estimates that in 2010, 99% of the population in Nevis used an improved drinking water source and 96% had adequate sanitation facilities. Nevis' water supply comes mainly via mountain spring intakes, and is supplemented by several earthen dams. The country's entire population has some degree of access to domestic water supplies. Sewage treatment in St Kitts and Nevis is limited; residents are largely dependent on septic tanks, soak ways and pit latrines.[53] The FAO indicates that, in 2012, over 98% of the population had access to at least basic drinking water services. The Figure below shows the change over time for SKN in the percentage of population using at least basic drinking water and basic sanitation services. While there are no data disaggregated to the Charlestown or parish level on access to drinking water or sanitation services, the Figure below is expected to be representative of the context for the ADI.

[53] The Nexus Commonwealth Network, St. Kitts and Nevis Water and Sanitation, accessed at http://www.commonwealthofnations.org/sectors-st_kitts_and_nevis/business/water_and_sanitation/



Source: FAO[54]

Figure 5-42. Percentage of Population Using Basic Drinking Water and Sanitation Services in SKN (2000-2013)

Further, below is a Figure with details on water consumption (per gallon) by different types of consumers between 2010 and 2017 in Nevis, showing that domestic consumption is highest, with commercial water consumption coming in second.

	Consumer				
Year	Domestic	Commercial	Farmers	Irrigation	Government
2010	263,634,050	33,905,120	4,319,570	38,484,000	12,500,000
2011	218,303,210	77,738,950	6,392,130	52,194,500	15,300,000
2012	223,485,503	65,057,025	5,424,890	44,189,895	13,000,000
2013	221,366,630	68,502,480	5,025,990	32,711,100	14,400,000
2014	243,561,420	81,684,089	5,480,570	28,966,300	9,030,496
2015	242,293,498	85,934,300	5,018,680	25,423,900	46,039,880
2016	258,151,260	71,455,660	5,121,280	27,320,400	37,522,801
2017	247,092,883	66,441,980	4,898,140	19,997,784	18,584,350

[54] FAO Statistics, accessed at http://www.fao.org/faostat/en/#country/188

Source: Water Department, Nevis Island Administration (NIA)

The Figure above is likely representative of the ADI, as it is a mostly urban region, where domestic, commercial and government consumption of water are likely higher than any other uses of water.

According to the 2nd National Communications Report of St. Christopher and Nevis under the United Nations Framework Convention on Climate Change (UNFCCC) from 2015 (from now on, "UNFCCC Communications Report"), the domestic sector consumes over 50% of the water supply (as is shown above), while consumption in each of the tourism, agriculture and commercial sectors accounts for between 10 and 15% of the country's total water supply. Overall water demand is increasing, most noticeably in the tourism sector (UNFCCC Communications Report). However, there are serious gaps between available supply and demand in Nevis, with a water supply deficit of approximately 40% (Adrian Cashman, Water Security and Services in the Caribbean, 2014). Groundwater produced from 14 active wells is the main source of supply in Nevis (US Army Corps of Engineers, "USACE", Water Resources Assessment of Dominica, Antigua, Barbuda, St Kitts and Nevis (2004)). Four distribution networks service the island: the Nevis Peak-New River System services the southern portion of the island; the Maddens System services the northeast portion; the Camp Spring-Jessup System services the northwest portion; and Charlestown is supplied by its own ground water wells (USACE Water Resources Assessment). In addition to the Charlestown wells, the water supply is supplemented by wells at Zion and Maddens (USACE Water Resources Assessment). Below is a table with the Nevis water supply for 1990 and the supply projected during 1990 for 1991.

Table 5-17. Nevis Water Supply System

System	Period	Gallons Per Day
Maddens	1990	1987,720
	1991	371,520
Camp Spring-Jessup	1990	76,320
	1991	112,320
Nevis Peak-New River	1990	273,600
	1991	388,800
Charlestown	1990	172,800
	1991	237,600
Total Supply	**1990**	**721,440**
1991 Projected Supply	**1991**	**1,110,240**

Source: National Report on Integrating Water-Watershed-and Coastal Areas Management for United Nations Environment Programmes, accessed at https://iwlearn.net/resolveuid/cf46cac46887f3fbdd358d619d9f3c60

According to the Water Services Department (WSD), in 2012 the total annual surface water produced in Nevis was 0.28 million m^3 and the total annual groundwater produced in Nevis was 2.48 million m^3.[55] For both St. Kitts and Nevis, it was 12.05 million m^3, of which 37% was surface water and 63% was groundwater.[56]

When compared with St. Kitts, however, Nevis, owing to the lower elevations, has a lack of major springs.[57] Further, the low elevations of Nevis mean that saline intrusion is a real concern for water supply (UNFCCC

[55] FAO Aquastat St. Kitts and Nevis, 2015, accessed at http://www.fao.org/NR/water/aquastat/countries_regions/KNA/print1.stm

[56] FAO Aquastat St. Kitts and Nevis, 2015, accessed at http://www.fao.org/NR/water/aquastat/countries_regions/KNA/print1.stm

[57] National Report on Integrating Water-Watershed-and Coastal Areas Management for United Nations Environment Programmes, accessed at https://iwlearn.net/resolveuid/cf46cac46887f3fbdd358d619d9f3c60

Communications Report). The average annual rainfall in Nevis is 1,170 millimeters, which is considerably lower than in St. Kitts (UNFCCC Communications Report). Due to the lower annual rainfall and lower yielding water sources, rural communities in Nevis often experience water shortages during the dry season (USACE Water Resources Assessment). As a result, many residents often resort to storage of rainwater in cisterns to augment supply, with 80-90% of residents and businesses in Nevis having facilities for engaging in rainwater capture (UNFCCC Communications Report). Most of the wells in Nevis are considered to be producing near peak capacity and desalination is not currently used to supplement resources in Nevis (UNFCCC Communications Report). However, as of May 2020, the Nevis Water Department is at the feasibility stage of a SKN Solar Water Desalination Project, which includes building a hybrid desalination plant on Nevis with concessionary funding from the United Arab Emirates.[58] Notwithstanding the small population, water consumption is estimated to be around 1.0 mg/d mainly due to the high demand from the tourism sector (UNFCCC Communications Report).

Both the CDB and the St. Kitts and Nevis Sugar Industry Diversification Fund (SIDF)[59] provided funding in 2014 for the Nevis Water Supply Enhancement Project, which is focusing on water supply and network upgrades; capacity building; public education and a water resource management component.[60] There is also a proposal to install a 300,000 gallon tank at Pond Hill.[61]

With regard to the ADI, as of May of 2020, Nevis was experiencing a prolonged period of drought, leading to water rationing and recommendations on water usage.[62] The Water Department had plans in place to augment their water supply through several Projects, one of which was bringing a developed well at the Hamilton Estate online that can produce 230 gallons of water per minute, but needs to be treated to be potable.[63] As of May 2020, due to the COVID-19 situation, the equipment and engineering firm cannot travel to Nevis, so plans to bring this well online are briefly on hold.[64] In addition to the well, the Water Department has initiated a new drilling program and has also successfully installed a 400,000 gallon Aquastore glass fused tank at Hamilton Estate to store more water in anticipation of a “Water Treatment Plan Project”.[65]

5.4.4.2 Energy

The Nevis Electricity Company Limited (NEVLEC) is the sole provider and distributor of electricity in Nevis (BV, 2014). The company, which opened its doors on September 1, 2000, is a fully owned subsidiary of the

[58] NIA, Minister Brand Issues Statement on Status of Water Supply in Nevis, 2020, accessed at https://nia.gov.kn/minister-brand-issues-statement-on-status-of-water-supply-in-nevis/

[59] To date, the Foundation has invested over US$ 55,000,000.00 in the development of St. Kitts & Nevis by way of grants, loans and share holdings. Capisterre Farm is one example of a project that received funding, and the St. Christopher National Trust was the beneficiary of a grant. Money was provided to the Development Bank of St. Kitts and Nevis to establish several funds including the Agricultural Fund, the Small Hotel and Restaurant Modernization Fund (SHARM) and the recently introduced Fund for the Realization of Economic Empowerment through Subsidized Housing (FREESH). The SIDF has also invested in Kittitian Hill, a five-star luxury resort under construction, and the St. Kitts Tourism Authority has received financing for the airlift support program. (SIDF, About Us, accessed at http://sknsidf.org/sidf-overview/)

[60] SIDF, Nevis Administration gets SIDF assistance for jointly funded CDB Water Enhancement Project, accessed at http://sknsidf.org/nevis-administration-gets-sidf-assistance-for-jointly-funded-cdb-water-enhancement-project/

[61] NIA, Minister Brand Issues Statement on Status of Water Supply in Nevis, 2020, accessed at https://nia.gov.kn/minister-brand-issues-statement-on-status-of-water-supply-in-nevis/

[62] NIA, Minister Brand Issues Statement on Status of Water Supply in Nevis, 2020, accessed at https://nia.gov.kn/minister-brand-issues-statement-on-status-of-water-supply-in-nevis/

[63] NIA, Minister Brand Issues Statement on Status of Water Supply in Nevis, 2020, accessed at https://nia.gov.kn/minister-brand-issues-statement-on-status-of-water-supply-in-nevis/

[64] NIA, Minister Brand Issues Statement on Status of Water Supply in Nevis, 2020, accessed at https://nia.gov.kn/minister-brand-issues-statement-on-status-of-water-supply-in-nevis/

[65] NIA, Minister Brand Issues Statement on Status of Water Supply in Nevis, 2020, accessed at https://nia.gov.kn/minister-brand-issues-statement-on-status-of-water-supply-in-nevis/

Nevis Island Administration (NEVLEC, 2020). NEVLEC owns a Diesel Power Plant at Prospect (the "Prospect Power Plant") which consist of 7 diesel engines, with a total installed name plate capacity of 13.9 MW, and an available maximum capacity of 12.9 MW. NEVLEC currently delivers approximately 55,112,474 kilowatt-hours (kWhr) per year to its customers, and expects this demand to increase by 3 percent annually (PIA, 2017).

In addition there is a wind farm with a name plate rating of 2.2 MW operated by Windwatt (Nevis) Ltd that has been in service since August 2010, the first in the Eastern-Caribbean, which provides limited amounts of electricity (IDB, 2013).

Electricity is distributed throughout the island via five (5) 11 kV feeders that originate from Prospect Power Plant (BV, 2014):

1. Charlestown Feeder #1
2. Charlestown Feeder #2
3. Cotton Ground Feeder
4. Gingerland Feeder
5. Four Seasons Feeder

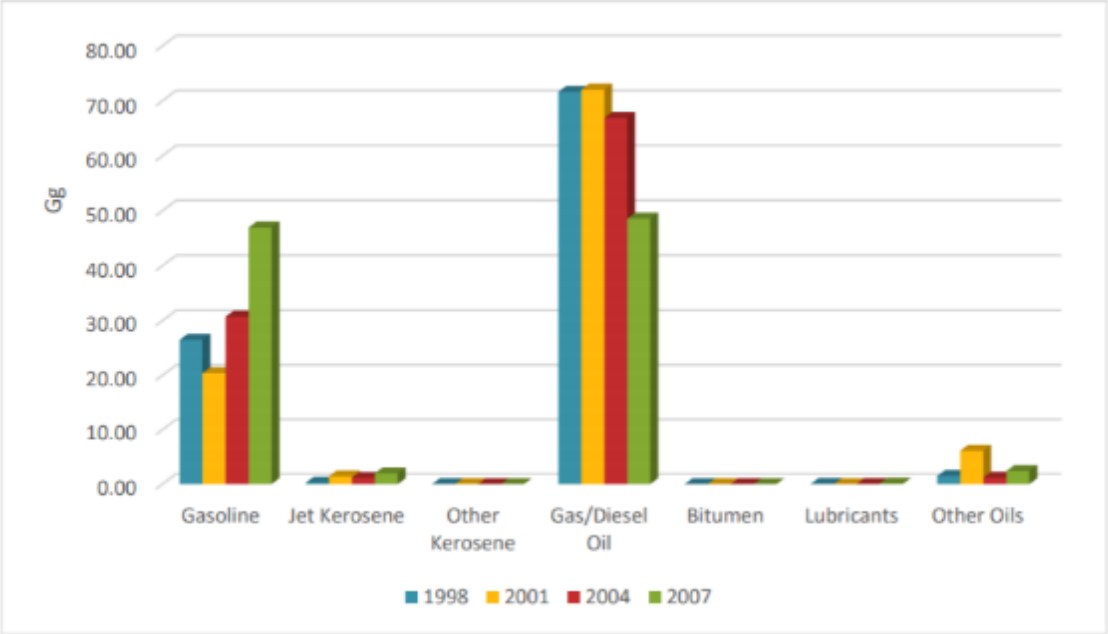
According to World Data, electricity consumption in Nevis totaled 103.4 m kWh, with production totaling 208 m kWh.[66] Under ideal conditions, SKN's total production capacity would be 562.39 m kWh, of which 528.65 m kWh would be from fossil fuels and 33.74 kWh would be from renewable energy.[67] There is no nuclear or hydropower capacity. In 2015, around 1.6% of actual total consumption in SKN was renewable energy.[68] Energy sector consumption in SKN in 2015 was based on fossil fuels imported for the purpose of electricity generation and transport. The consumption of gasoline, jet kerosene, other kerosene, gas/diesel oil, bitumen, lubricants and other oils was responsible for the energy sector's greenhouse gas emissions (UNFCCC Communications Report).

The Figure below shows CO_2 emissions from energy sources and fuel combustion categories in SKN for 1998, 2001, 2004 and 2007.

[66] World Data Energy Consumption in Saint Kitts and Nevis, accessed at https://www.worlddata.info/america/stkitts-nevis/energy-consumption.php#:~:text=of%20electric%20energy%20per%20year,an%20average%20of%203%2C688%20kWh.

[67] World Data Energy Consumption in Saint Kitts and Nevis, accessed at https://www.worlddata.info/america/stkitts-nevis/energy-consumption.php#:~:text=of%20electric%20energy%20per%20year,an%20average%20of%203%2C688%20kWh.

[68] World Data Energy Consumption in Saint Kitts and Nevis, accessed at https://www.worlddata.info/america/stkitts-nevis/energy-consumption.php#:~:text=of%20electric%20energy%20per%20year,an%20average%20of%203%2C688%20kWh.



Source: UNFCCC Communications Report, 2015

Figure 5-43. CO_2 Emissions in Energy Sector

The Figure shows that gas/diesel and gasoline were the highest contributors of greenhouse emissions in the energy sector.

It should be noted that SKN has a cooperative agreement with the European Union for aid with macroeconomic support, sectoral policies, humanitarian aid, and emergency and post-emergency assistance.[69] This agreement focuses mainly on the energy sector, with SKN preparing a draft National Energy Policy (NEP) in 2011 with funding from the EU and other development partners, which identified the target of 60% generation of energy from renewable resources by 2020 (National Indicative Programme). The NEP underscores that SKN aims to become the smallest green nation in the Western Hemisphere with a sustainable energy sector providing reliable, renewable, clean and affordable energy services to all its citizens. The need for energy reform in SKN is contextualized by the ongoing economic transformation embarked upon by the government, from an agriculture-based to services-oriented economy, which focuses primarily on high-end tourism (National Indicative Programme). The resultant increase in economic activity including foreign direct investment, commercial, and residential development and immigration has significantly affected the demand for electricity (National Indicative Programme). In 2010, SKN spent XCD 61 million for the importation of petroleum and the relative share of energy expenditures in the household budget was 4.2% (compared with 2.1% in the United Kingdom) (National Indicative Programme). Until 2005, the price for electricity was maintained relatively low, primarily through the provision of a subsidy provided by the government; however, due to increases in the price of oil, the government introduced a fuel surcharge in St. Kitts in October of 2005 and in Nevis in December of 2005 (National Indicative Programme). Oil prices continued to increase, meaning that retail prices for electricity doubled from late 2005 to August 2012, when the government intervened again in 2013 by subsidizing the fuel surcharge (National Indicative

[69] National Indicative Programme for co-operation between the European Union and Saint Kitts and Nevis, 2014-2020, accessed at https://ec.europa.eu/international-partnerships/system/files/nip-edf11-st-kitts-navis-2014-2020_en.pdf ("National Indicative Programme")

Programme). Electricity prices averaged USD 0.21 / kWh, compared to USD 0.05-0.08 / kWh in Florida (National Indicative Programme).

In SKN, electricity is primarily produced by small diesel fueled generators, with only a small percentage produced by solar and wind energy, which means that the country's already vulnerable position is exacerbated by a very high dependency on imported fossil fuels for electricity generation as well as for transportation (National Indicative Programme). This is also shown in the Figure above. Further, the power supply systems in SKN are operated independently and are not interconnected; for Nevis, the Nevis Electricity Company Limited (NEVLEC) is headquartered in Charlestown. Current peak electricity demand in Nevis is 9.73 MW (National Indicative Programme). A pre-feasibility study on the SKN electricity interconnection undertaken by the Energy and Climate Change Partners of the Americans concluded that, upon the production and sale of geothermal energy in Nevis, the cost of electricity could be significantly reduced in St. Kitts if the connection is established (National Indicative Programme).

Lastly, it is important to note that in Nevis, NIA has operated a 2.2MW wind farm since 2010, and commercial operators and residential consumers are increasingly investing in renewable technologies (National Indicative Programme).

While there are no specific data disaggregated to the Charlestown or parish level on energy consumption, the context presented above can be considered representative of the situation in the ADI.

5.4.4.3 Sewage Water

Treatment of sewage is an issue of environmental concern on the islands, particularly as it relates to solid waste management, sewage collection, treatment and disposal (CDB Country Strategy 2013-2016). SKN has no centralized sewage system. The only sewage treatment plant in Nevis is located at the Four Seasons Resort. Most commercial and residential buildings have septic tanks and water closets, with pit latrines used to a lesser degree (USACE Water Resources Assessment). To date, this has not resulted in any contamination of the groundwater resources. However, grey water from commercial buildings and homes drains into the storm drains and into the near-shore marine environment (CDB Country Strategy 2013-2016). In addition, it should be noted that an investigation conducted on eight marine sites by the St. Kitts Foundation in association with the Ocean Foundation found that water quality is being compromised by inadequately treated sewage and from industrial, urban, harbor and cruise ship sources (CPA). According to the CDB, 87% of Nevis' population has wastewater coverage.[70]

With regard to the ADI, with the CDB's intervention, there will be a project to conduct a drainage and sewage improvement plan for Charlestown, including preliminary design options and capital cost estimates (CDB Country Strategy 2013-2016).

5.4.4.4 Garbage Disposal

According to the country's CPA, a major source of environmental degradation is the area of garbage disposal. The small size of the country and the lack of facilities for recycling and collection of waste, especially non-biodegradable waste, poses a major problem for the country, especially because it has a material culture highly reliant on imported materials that are not easily disposed of when discarded at the level of the household. SKN, like other parts of the Commonwealth Caribbean, has invested in landfill sites and other upgrades of waste disposal. Ultimately, small size remains a major constraint in creating an effective solution. Garbage disposal is particularly problematic in Nevis, given the tourism sector (CPA). UNDP states that there is a need to develop a comprehensive wastewater management plan, particularly

[70] CDB, Climate Proofing the Water Sector: Investment and Financing, 2016 accessed at https://www.caribank.org/publications-and-resources/resource-library/presentations/climate-proofing-water-sector-investments-and-financing

for urban areas in SKN, and that while there is a coordinated approach to waste management in general, there is no comprehensive waste management plan in place.[71] It is relevant here to note that the Constitution of SKN, which grants a significant level of autonomy to the NIA, in several instances, constrains the effective and uniform implementation of key pieces of legislation across the Federation. Some of these include Development Control and Planning Act, the Solid Waste Management Corporation Act and the National Conservation and Environmental Protection Act.[72]

The Nevis Solid Waste Management Authority is the agency responsible for collection of domestic waste in Nevis. The island is subdivided into five districts for this purpose. Four districts are served directly by government and the fifth, by a private contractor, hired by the government (Island Studies Jurisdiction Project). [73] Solid waste is collected from households at least twice a week. Companies and private institutions hire private contractors to remove their solid wastes. However, according to the Island Studies Jurisdiction Project, small inns and villas tend to be serviced by the Government free of charge. For many years, waste was being burnt, with the expectation that a landfill would be constructed (Island Studies Jurisdiction Project). The dumpsite was operated on Nevis by the then Sanitation Department, under the umbrella of the Ministry of Health (NIA). However, in 2001 the OECS mobilized the conversion from dumpsites to landfills in member states (NIA). In 2002, the landfill was constructed and equipped with funding from the World Bank on the basis of an OECS waste initiative at a cost of just over 2 million $US (Island Studies Jurisdiction Project). The estimated life span of the landfill is about a decade, but it is envisaged that by resorting to separation of garbage in individual cells that receive paper, plastics, metal and glass, respectively, the life span could be extended (Island Studies Jurisdiction Project). In 2002, the Nevis Solid Waste Management Authority was created as a statutory body of the Nevis Island Administration under the Ministry of Health (NIA). As a result of this conversion, the practice of burning domestic waste ceased at the Low Ground Landfill (NIA). The landfill approach to managing waste is deemed a more environmentally friendly approach which involves spreading, compacting and burial of waste (NIA). There is also a used oil facility with a capacity of some 120,000 gallons. As of 2003, an incinerator had been installed for burning oil and was expected to be commissioned shortly (Island Studies Jurisdiction Project). However, as of the date of this Preliminary Supplemental ESIA, the Nevis Solid Waste Management Authority confirmed that there was no oil incinerator in the landfill. A concrete cell in the landfill was reserved for used batteries for eventual export when a sufficient quantity had accumulated (Island Studies Jurisdiction Project). Semi-solid waste from the pumping of sewer systems is also brought to a special section of the landfill and is neutralized by lime and retained in cells to avoid the percolation of the liquid contents into the soil (Island Studies Jurisdiction Project). Hazardous waste is stored separately and arrangements are being made for its transshipment for decontamination abroad in cases where the facility is unable to provide the necessary treatment for the particular substance (Island Studies Jurisdiction Project).

Currently, the services offered by the Nevis Solid Waste Management Authority include bin rentals, daily household waste collection, appliance and bulky items collection and beach and village clean-up support (NIA). The services do not collect electronics, dirt/rocks, appliances, tires, vehicle batteries, construction debris or grass and garden waste (NIA). The Nevis Solid Waste Management Authority has grown to a staff of 26 persons, and is working with a St. Maarten based company to collect, compress and ship out over

[71] UN-DESA Third International Conference on Small Island Sates, St. Kitts and Nevis, accessed at https://sustainabledevelopment.un.org/content/documents/1129245SKN%20Final%20Draft%20National%20Report.pdf

[72] UN-DESA Third International Conference on Small Island Sates, St. Kitts and Nevis, accessed at https://sustainabledevelopment.un.org/content/documents/1129245SKN%20Final%20Draft%20National%20Report.pdf

[73] Island Studies Jurisdiction Project Nevis, accessed at https://www.islandstudies.ca/sites/islandstudies.ca/files/jurisdiction/Nevis.pdf

250 derelict vehicles and other scrap metal to a recycling plant in New Orleans.[74] The Authority has also purchased a tire bailer and plans on the diversion of glass and plastic material to prolong the lifespan of Long Point landfill by minimizing the demand for space.[75]

In 2014, the government of Nevis signed off a deal that will see a waste to energy facility constructed on the island in partnership with Maryland-based renewable energy firm, Omni-Alpha.[76] The partnership will also see the construction of a solar energy farm by Omni-Alpha to support the waste to energy plant and ensure the constant delivery of some 2250 MWh of power per year to the electricity grid on Nevis (Waste Management World). According to the NIA, the waste to energy plant will consume virtually all of the island's household and commercial waste, tires, plastics, paper, plant and vegetable material and provide much needed ease on the island's sole solid waste disposal site at Long Point, Nevis (Waste Management World). The NIA explained that with constantly fluctuating oil prices and a population harassed by increasing electricity costs, it embarked on a program of replacing fossil based energy generation with renewable energy sources (Waste Management World; see also Section 5.4.4.2). As of the date of this Preliminary Supplemental ESIA, the waste to energy facility is not yet in construction.

In 2017, it was reported by the manager of the Nevis Solid Waste Management Authority, Andrew Hendrickson, that there is a problem with the number of persons illegally dumping trash in parts of the islands, with problem areas being Bath Village around the landfill, Potworks in areas close to the Medical University of the Americas, Hicks Estate and Hanley's Road.[77] Waste being illegally dumped includes refrigerators, stoves, washing machines and green waste, because people have sometimes been fooled by truckers to have them dump their refuse at illegal dumping sites.[78] According to the manager of the Nevis Solid Waste Management Authority, truckers are exploiting the misconception that it is expensive to dump at the landfill, which costs $70 per ton.[79] Hendrickson stated that illegal dumping, if continued, could have a financially negative impact on the island and encouraged the public to dump their household garbage properly for garbage collection.[80]

There are no garbage disposal data disaggregated to the Charlestown or parish level, as there is only one landfill on the island.

5.4.4.5 Road Infrastructure

The country is served essentially by one main highway that rings the island (generally along the coast, except for a more inland route across the southern portion of Nevis). A series of smaller secondary and tertiary roads provide links to other parts of the island (UNFCCC Communications Report). Driving on Nevis is on the left side of the road (OSAC_2020). The main ring highway is also used for recreational bicycling (Bikemap 2020).

The closure of the sugar industry, which was the primary source of support and upkeep for the island's road infrastructure, has led to reduced maintenance, including failure to rebuild or replace roads washed away

[74] Global Islands, St. Kitts and Nevis, accessed at http://www.globalislands.net/greenislands/index.php?region=4&c=29

[75] Global Islands, St. Kitts and Nevis, accessed at http://www.globalislands.net/greenislands/index.php?region=4&c=29

[76] Waste Management World, $20m Waste to Energy Deal Sealed on Caribbean's Nevis Island (2014), accessed at https://waste-management-world.com/a/20m-waste-to-energy-deal-sealed-on-caribbeans-nevis-island ("Waste Management World")

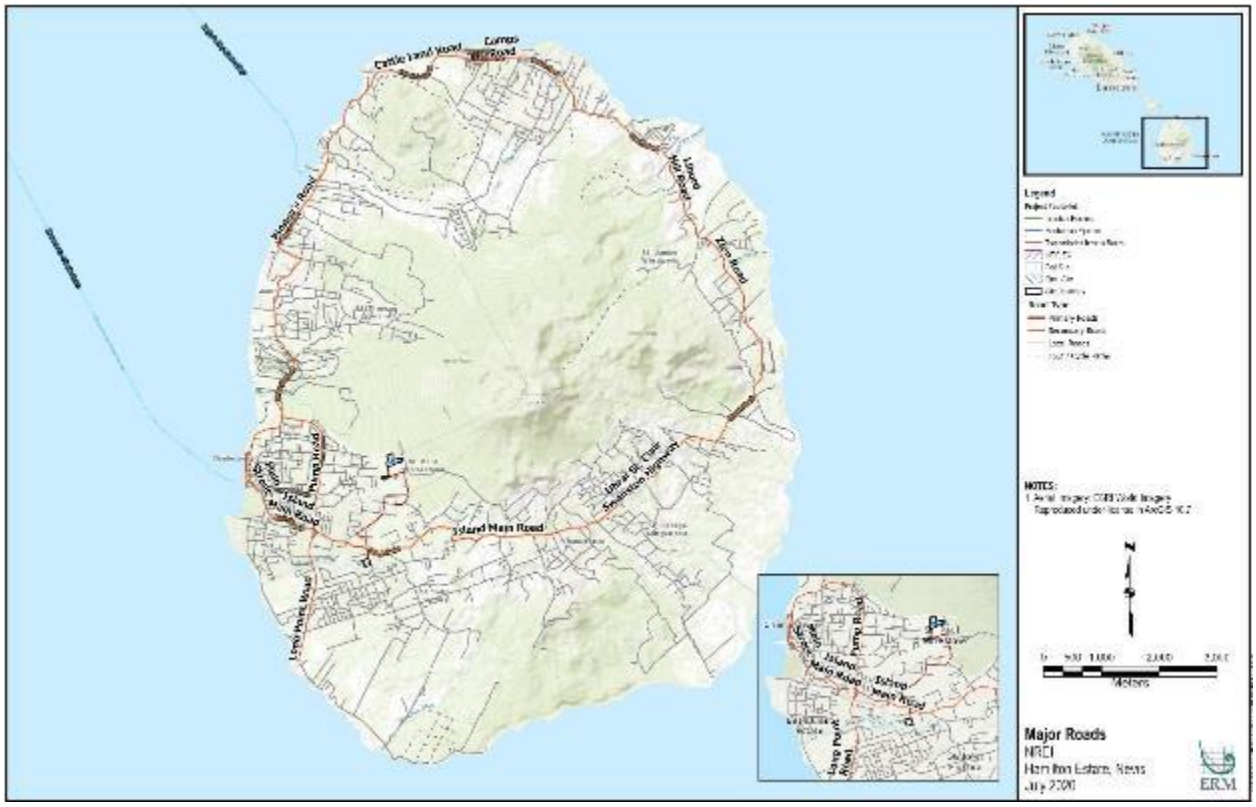
[77] St. Kitts and Nevis Observer, Illegal Dumping Causes and Improper Disposal of Garbage Causes Concerns (2017), accessed at https://www.thestkittsnevisobserver.com/illegal-dumping-causes-improper-disposal-garbage-causes-concerns/

[78] St. Kitts and Nevis Observer, Illegal Dumping Causes and Improper Disposal of Garbage Causes Concerns (2017), accessed at https://www.thestkittsnevisobserver.com/illegal-dumping-causes-improper-disposal-garbage-causes-concerns/

[79] St. Kitts and Nevis Observer, Illegal Dumping Causes and Improper Disposal of Garbage Causes Concerns (2017), accessed at https://www.thestkittsnevisobserver.com/illegal-dumping-causes-improper-disposal-garbage-causes-concerns/

[80] St. Kitts and Nevis Observer, Illegal Dumping Causes and Improper Disposal of Garbage Causes Concerns (2017), accessed at https://www.thestkittsnevisobserver.com/illegal-dumping-causes-improper-disposal-garbage-causes-concerns/

by weather events (CPA). As of 2018, rehabilitation of the main roads on Nevis, as well as St. Kitts was ongoing. The Government has also continued to upgrade other physical infrastructure, including ports, other roads, electricity, water, and communications on both islands (CDB's Country Economic Review 2018, St. Kitts and Nevis).



Source: ERM, 2020

Figure 5-44. Major Roads in Nevis

As of 2014, there were a total of 4,661 vehicles (all classes) registered on the Island (Nevis Statistical Digest, 2015). Although the number of registered vehicles fluctuates yearly, this represents an increase of approximately 17% since 2005. Of the 2014 total, approximately 70% were private cars and motorcycles, while 22% were commercial vehicles and the remaining 8% were public service vehicles (Nevis Physical Development Plan, 2016). This means that just over half of the adult population (over 20 years old) owns a vehicle (Nevis Physical Development Plan, 2016). If the growth trend continues, the Island's road network, junction capacity and parking space provisions will not be able to adequately accommodate this level of traffic, particularly in Charlestown (Nevis Physical Development Plan, 2016).

Traffic Accidents

The table below summarizes traffic accident data from the Nevis Statistical Digest (2018). In 2017 (the most recent year for which data are available), there were no traffic-related fatalities, 16 serious injuries, 56 slight injuries, and 290 non-injury (property damage only) accidents. Total accidents in 2017 were the highest recorded since 2010, reflecting an increasing trend in all accident types except fatalities. In 2019, there were two road fatalities in Nevis (Von Radio 2020). The Superintendent of Police in Nevis, Lyndon David, has stated that the police department will use police cars, motorcycles and jeeps, as well as police wardens,

constables to enforce traffic laws (Von Radio 2020). There are no data disaggregated to the Charlestown level.

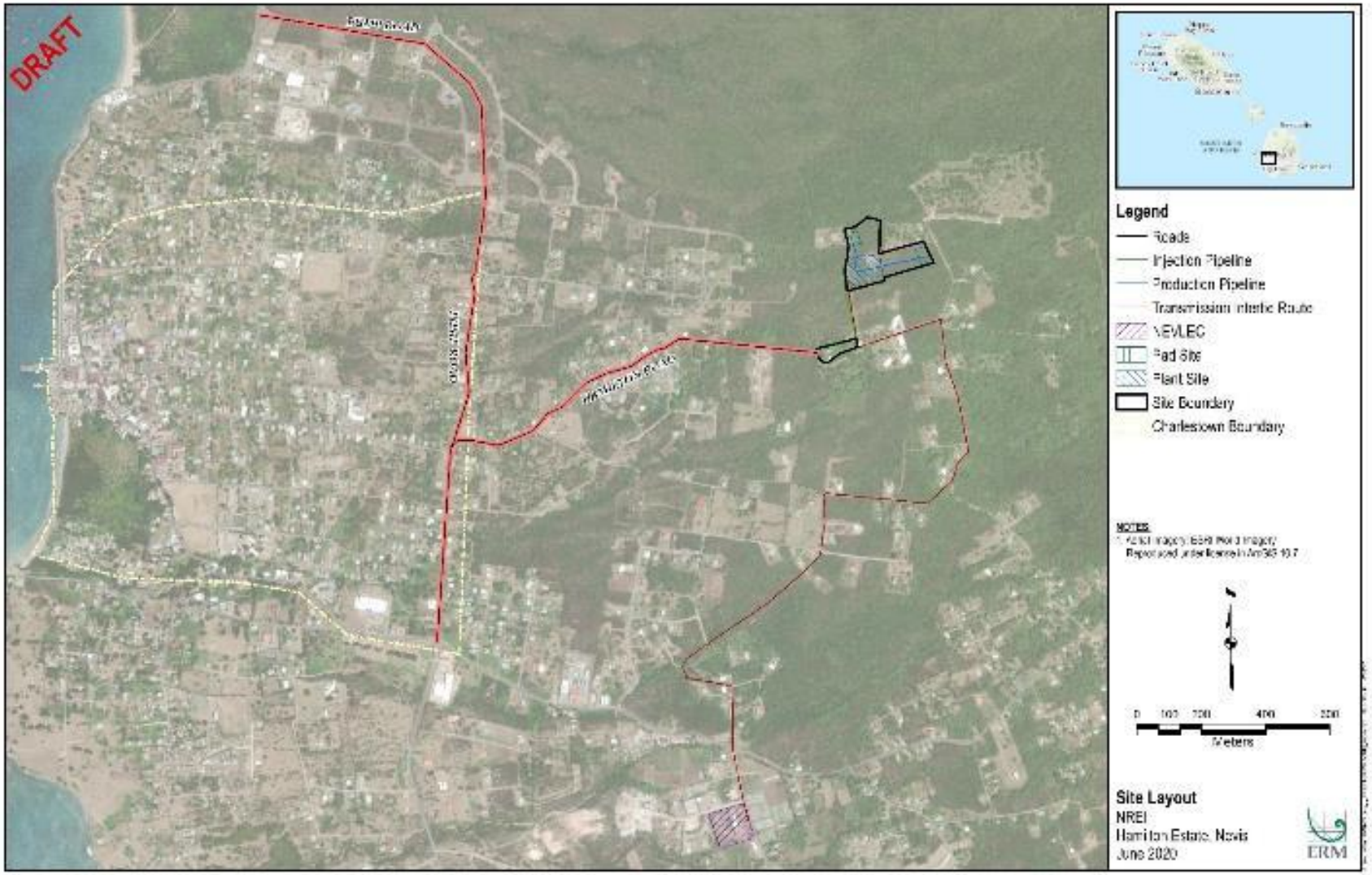
Table 5-18. Traffic Accidents by Injury 2010-2017

Results of Accident	2010	2011	2012	2013	2014	2015	2016	2017
Fatalities	1	1	0	2	2	0	0	0
Serious Injury	7	6	6	5	7	3	4	16
Slight Injury	29	32	31	37	35	30	42	56
Non-Injury	251	196	180	193	201	237	250	290
Total Accidents	288	235	217	237	245	272	296	362

Source: Traffic Department of the Royal St. Christopher and Nevis Police Force, Division “C”

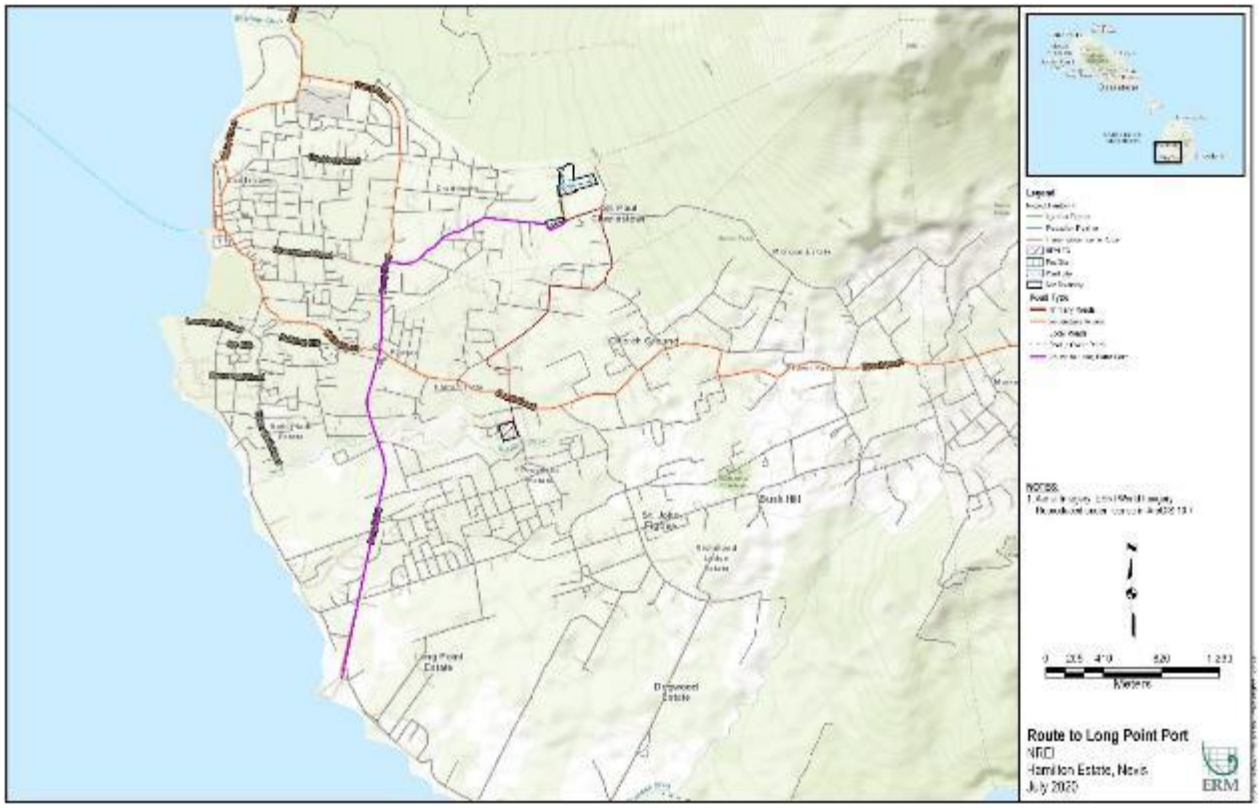
Road Infrastructure in ADI

In 2015 two major road improvements opened in Charlestown (Figure 5-45. Location of New Roads in ADI): the Hamilton Road, which leads from Pump Road to Carl Tucket Boulevard; and Pump Road itself, which leads from the roundabout adjacent to the Bath Cemetery into the bypass road to the Stuart Williams Drive (Nevis Statistical Digest 2018). Road access to the Project site would be via Hamilton Road and a local road from Hamilton Road to the Plant Site. Trucks providing deliveries from Long Point Port would use Hamilton Road, Pump Road and Long Point Road. Roads are generally 2 lanes, paved, without lane markings and with narrow or no shoulders. Road widths vary from 4 meters (parts of Hamilton Road) to 7.5 meters (the road to Long Point Port).



Source: ERM, 2020

Figure 5-45. Location of New Roads in ADI

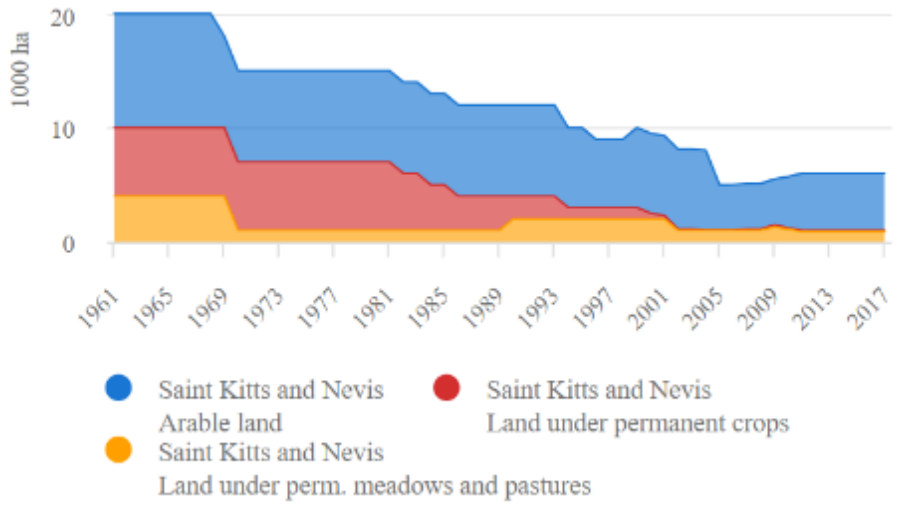


Source: ERM 2020

Figure 5-46. Roads between Project Site and Long Point Port

5.4.5 Land Use, Ownership and Housing

According to the FAO, in 2017, 6% of the land in SKN was used for agriculture (5% was arable land, 0.1% was for permanent crops, and 0.9% was for permanent pastures). Arable land is land cultivated for crops like wheat, maize and rice that are replanted after each harvest, while permanent crops is land cultivated for crops like citrus, coffee and rubber that are not replanted after each harvest, and includes land under flowering shrubs, fruit trees, nut trees and vines. See the Figure below for an illustration of these percentages.



Source: FAO

Figure 5-47. Agricultural Area of SKN (1961-2017)

The Food and Agriculture Organization (FAO) states that, as a result of their origins as plantation economies, SKN and other Caribbean countries, are characterized by inequity in the ownership and control of land, which has been historically dominated by a small and privileged elite. As a result, many persons occupy the land on which they farm or reside as land tenants. In Nevis, 18% of land is rented (Land Law and Agricultural Production in the Eastern Caribbean, FAO). Estates have been compulsorily acquired for the purposes of land reform in Nevis, however, so the amount of private land has decreased in recent years (Land Law and Agricultural Production in the Eastern Caribbean, FAO).

According to the Land Law and Agricultural Production in the Eastern Caribbean report, the most recent security of tenure legislation is the St. Kitts and Nevis Land Development Act 1991, which provides for the registration of agricultural lands and for the security of tenure for tenant farmers on such land. The Act provides for agricultural lands to be leased for periods of 35 years under registered leases and protects lessees from eviction by the landlord provided that the land is developed and used in accordance with the lease. The lessee is permitted to mortgage or charge the leasehold land as security for a loan from a bank prescribed under the Act. It appears that this Act is intended to apply to publicly owned land and to provide a framework for the regularization of Government's practices regarding the leasing of agricultural land. However, it is reported that implementation of the legislation has been slow in getting off the ground. Previously, farmers were given possession of land under a letter of intent. However, they did not qualify for loans under the letter of intent as they could not utilize their land as collateral.

Further, the report states that the St. Kitts and Nevis Village Freehold Purchase Act 1996 is an example of legislation for the freehold enfranchisement of land tenants. The Act confers upon the tenants of land in prescribed areas, the option to purchase the land on which they have been residing for a specified period at a special price. The tenant may exercise this option by serving notice on the landlord, and in the case of St. Kitts and Nevis, the Minister responsible for lands. This legislation has been successfully implemented and a number of title transfers have already taken place. This type of program has implications for agriculture only insofar as it promotes investment in land in rural villages and provides an impetus to continued residence in such areas.

In 2005, the Nevis Physical Planning and Development Control Ordinance, No.1 of 2005, was enacted. The Nevis Island Ordinance makes full provisions for the preparation of land use plans, including express

provisions for ensuring that land use planning is part of an integrated development planning process. Provisions, similar to those in the Organisation of Eastern Caribbean States Model Act, are also made with respect to the legal status of land use plans (Land Law and Agricultural Production in the Eastern Caribbean, FAO).

In St. Kitts and Nevis, the main legislation dealing with the management of water resources is the Watercourses and Waterworks Act, Cap.185. This Act establishes a Water Board that is responsible for the control, management, maintenance and supervision of all watercourses and waterworks in St. Kitts and Nevis, but other legislation assigns the functions of the Water Board in Nevis to the Nevis Island Administration. The Act provides for the declaration of specific areas as watersheds, within which certain activities may be regulated. Additionally, the National Conservation and Environmental Protection Act, No.5 of 1987, also provides for the conservation of water and watersheds. Under this Act the Minister, in consultation with the Water Board, may make Regulations for the conservation and development of the country's water resources. No such regulations have been made, but the Regulations made under the Watercourses and Waterworks Act prohibit certain activities, including cultivation and grazing, within a prescribed distance from watercourses plans (Land Law and Agricultural Production in the Eastern Caribbean, FAO).

The Land Law and Agricultural Production in the Eastern Caribbean report by the FAO further states that, in St. Kitts and Nevis, the conservation of forests and wildlife and the establishment of protected areas are covered by the unique National Conservation and Environmental Protection Act, No.5 of 1987, (the NCEPA) which repealed and replaced the laws relating to forests and wildlife. Two historic sites, Brimstone Hill in St. Kitts and Bath Hotel in Nevis, are specially protected by the Act, but it also makes provisions for the protection of other areas for the purposes inter alia of conserving biodiversity, specific species and ecosystems and natural areas that are important for basic ecological processes, including water recharge and soil regeneration. The Act provides for the establishment of a Conservation Commission with advisory and trusteeship functions. However, the fact that no Commission was appointed for several years stymied the implementation of the law. As a result, the Act was amended by Act No.12 of 1996 to establish a Department of Environment (DOE) and make provision for the administration of the Act by the DOE. Under the Act, various activities that can degrade the environment are prohibited or controlled. These activities include the cultivation, clearance or burning of certain lands and the grazing of livestock. In 2002, the National Legal Consultant reported that the Act was being enforced, although most of the prosecutions up to that date were for offences such as littering and the unlawful removal of beach sand. A comprehensive review of the legal and institutional framework for environmental management in St. Kitts and Nevis identified several deficiencies in the existing law and institutional arrangements for its administration. Following that review, a Bill for a National Conservation and Environmental Management Act (NCEMA) to repeal and replace the obsolete NCEPA was drafted in 2005, but this legislation has not yet been enacted (Land Law and Agricultural Production in the Eastern Caribbean, FAO, citing Toppin-Allahar, C. 2004, 2005. Review of the Legal and Institutional Framework for Environmental Management in St. Kitts and Nevis, OECS Environment and Sustainable Development Unit (2004) and the draft National Conservation and Environmental Management Bill, 2005).

With regards to housing, in the late 1960s about 4% of Nevis's land was used for housing (Inter-American Institute for Cooperation in Agriculture, Macroeconomic and Agricultural Sector Data of Participating Countries, 1992). In the late 1980s, 82% of land was owned by users in SKN, with 8% rented or leased, 7% classified as "other" and 3% classified as free (Inter-American Institute for Cooperation in Agriculture, Macroeconomic and Agricultural Sector Data of Participating Countries, 1992). During that time, government-owned land in Nevis was being redistributed through long-term leases and sales to farmers due to signs of greater interest in farming (Inter-American Institute for Cooperation in Agriculture, Macroeconomic and Agricultural Sector Data of Participating Countries, 1992). The population of Nevis have historically lived in nucleated areas and settlements strung out along the main circumferential road

(Frucht, 1968). Not unlike other small states in the Caribbean, most of the SKN's settlement and its critical social and economic infrastructure are sited within 0.5 km from the coast at 'normal' mean high water (UNFCCC Communications Report). Nevis is served essentially by one main highway that rings the coast, which is adjoined by a series of smaller secondary and tertiary roads (UNFCCC Communications Report). All critical infrastructure and the socio-economic activities that they support (tourism and recreation, port services, housing, education, health care facilities, trade and commerce and other services) follow this network, and for the most part are sited no further than a few hundred meters from the main coastal artery (UNFCCC Communications Report). The threats of land loss from coastal erosion, sea level rise and storm surge currently pose severe challenges to SKN, and to that extent the safety and security of much of the country's infrastructure, economy and livelihoods are at great risk (UNFCCC Communications Report).

In the past, large landowners appeared to be interested in selling and renting land to tourists and other foreign developers (Frucht, 1968). Between 1970 and 1998, the CDB funded two urban infrastructure development projects focused on providing housing in SKN (CDB, Urban Revitalization Strategy and Operational Guidelines, 2000). Currently, the Nevis Lands and Housing Development Corporation is responsible for the lease, sale and development of government lands.[81] Their activities have been primarily in the area of housing. The Ministry of Agriculture, Lands, Housing and Co-operatives has control over the annual rental and management of government lands, including government estates used for either crop or livestock production.[82] There is an Environment Desk within the Planning Unit which has authority over environmental matters.

Further, SIDF established a Fund for the Realization of Economic Empowerment through Subsidized Housing (FREESH) to encourage citizens to invest in residential housing.[83] The initiative was revised to be more attractive to prospective homeowners and new terms and conditions took effect on July 24, 2012.[84] In 2013, yet another amendment to the FREESH program was made. In response to feedback from the financial institutions and aspiring homeowners who had begun construction out-of-pocket, the eligibility requirements were broadened to include applicants with ongoing construction whereas previously only those undertaking new/breakground construction qualified for funding.[85] In July 2014, St. Kitts-Nevis-Anguilla-National Bank joined the FREESH program, providing 100% of the loans funds to mortgagees.[86] As of February 2015, 88 loans had been disbursed in Nevis.[87]

Land Use in ADI

With regard to the Project Footprint, it is located on 10.7 acres of land formerly used as a sugar plantation. There is no current agricultural use other than rough grazing for goats and donkeys, while adjacent lands have been sold for private housing, hotel development, and small-scale agriculture (Report for Environmental Impact Assessment for Thermal Energy Partners, Jennifer Lowery, March 2017). There are at least 14 parcels owned by private landowners surrounding the Project, which are either being used for

[81] FAO, accessed at http://www.fao.org/3/y1717e15.htm

[82] FAO, accessed at http://www.fao.org/3/y1717e15.htm

[83] SIDF, Fund for the Realization of Economic Empowerment Through Subsidized Housing, accessed at http://sknsidf.org/fund-for-the-realization-of-economic-empowerment-through-subsidized-housing-freesh-2/

[84] SIDF, Fund for the Realization of Economic Empowerment Through Subsidized Housing, accessed at http://sknsidf.org/fund-for-the-realization-of-economic-empowerment-through-subsidized-housing-freesh-2/

[85] SIDF, Fund for the Realization of Economic Empowerment Through Subsidized Housing, accessed at http://sknsidf.org/fund-for-the-realization-of-economic-empowerment-through-subsidized-housing-freesh-2/

[86] SIDF, Fund for the Realization of Economic Empowerment Through Subsidized Housing, accessed at http://sknsidf.org/fund-for-the-realization-of-economic-empowerment-through-subsidized-housing-freesh-2/

[87] SIDF, Fund for the Realization of Economic Empowerment Through Subsidized Housing, accessed at http://sknsidf.org/fund-for-the-realization-of-economic-empowerment-through-subsidized-housing-freesh-2/

residential purposes or are unused and undeveloped. In addition, there is a restaurant close to the site (Bananas Restaurant). The Figure below shows these parcels.

Source: ERM, 2020

Figure 5-48 Land Ownership

Further, the Figure below shows the ownership of the parcels with regards to whether they are currently leased, or available to be leased, by NREI.

Source: ERM, 2020

Figure 5-49 Lease Status

There were no data available on land use and ownership disaggregated to the Charlestown level. See Figure 5-2. Land Use in ADI in Section 5.4.1 for satellite images of land use in the Project Footprint.

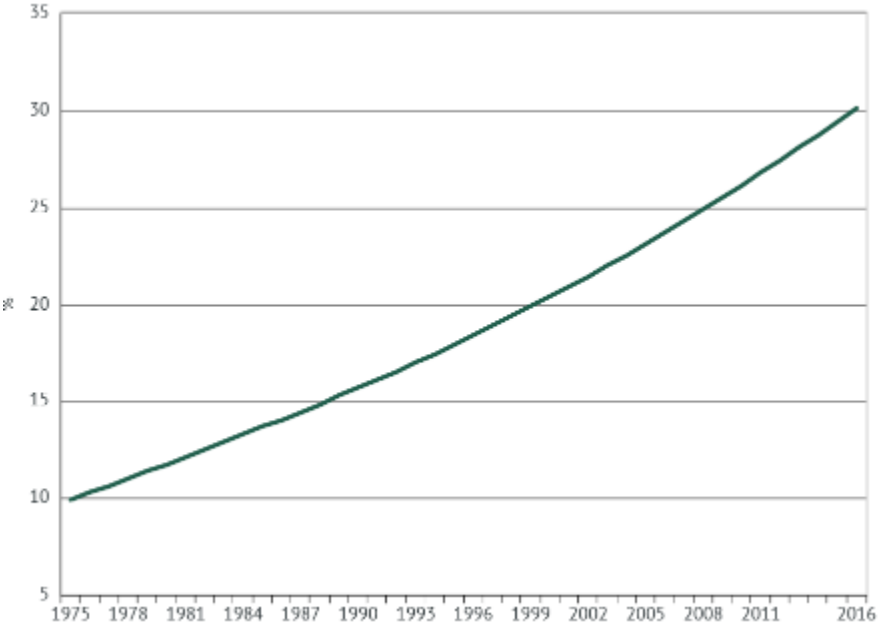
5.4.6 Community Health, Safety and Security

5.4.6.1 Main Diseases

Circulatory diseases are the leading cause of death, and cancer is the third leading cause of death in SKN (PAHO/WHO). According to the CPA, 11.4 percent of males and 15.3 percent of females reported suffering from chronic lifestyle diseases, including hypertension, diabetes, obesity and cancers. There was a high incidence of lifestyle diseases (such as diabetes and high blood pressure, prostate cancer among males and a few cases of HIV/AIDS) among both male and female residents in all of the communities studied in the CPA. Another major challenge the country has faced is the HIV/AIDS pandemic. There was initially a universal denial of the presence of the disease, in spite of the fact that there is an illegal commercial sex industry (CPA). However, nowadays the prevalence rate of HIV in adults in SKN is very low (0.9% as of 2009), with the country reporting that there were 84 patients receiving care for HIV.[88] Another problem identified in the PPA was the spread of drug abuse, including alcohol abuse, but also of other drugs, such as cocaine and marijuana. The growth in the population of vagrants and homeless people was attributed

[88] PAHO, Antiretroviral Treatment in the Spotlight St. Kitts and Nevis, accessed at https://www.paho.org/hq/dmdocuments/2012/SaintKitts.pdf

to mental illness that derived from drug abuse (CPA). In 2016, the female obesity rate in SKN was 30.1% and the male obesity rate was 15.3%.[89] The figures below show the increase in obesity rates since 1975.

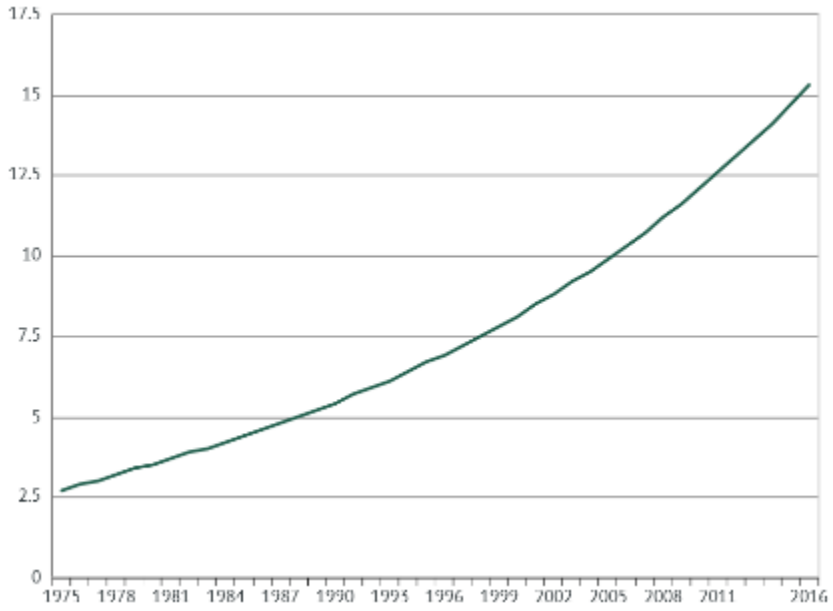


Source: KNOEMA[90]

Figure 5-50. Female Obesity Rates SKN (1975-2016)

[89] KNOEMA, SKN Female Obesity Prevalence, accessed at https://knoema.com/atlas/Saint-Kitts-and-Nevis/Female-obesity-prevalence and SKN Male Obesity Prevalence, accessed at https://knoema.com/atlas/Saint-Kitts-and-Nevis/Male-obesity-prevalence

[90] KNOEMA, SKN Female Obesity Prevalence, accessed at https://knoema.com/atlas/Saint-Kitts-and-Nevis/Female-obesity-prevalence



Source: KNOEMA[91]

Figure 5-51. Male Obesity Rates SKN (1975-2016)

Dengue is endemic in the country. Between 2011 and 2014, there were 63 cases of dengue fever reported, with an outbreak in 2011, and no cases were reported in 2015. Malaria is not endemic, but two cases of imported malaria were reported between 2011 and 2015.[92]

In February 2014, the Federation recorded its first case of chikungunya fever, and by the end of the year 28 confirmed and 627 suspected cases had been reported. As of September 2016, there were three confirmed cases of Zika fever with no medical complications. Subsequent to the 2009 H1N1 influenza pandemic, influenza A(H1N1) circulates seasonally, but there have been no outbreaks. There have been no reported cases of cholera, rabies, leprosy, or other neglected diseases in the 2010–2015 period. National policies to address antimicrobial resistance and, with the exception of HIV, disease-specific surveillance for antimicrobial resistance, are not yet in place.[93]

The table below shows data regarding chronic lifestyle diseases in SKN by sex and consumption quintiles.

[91] KNOEMA, SKN Male Obesity Prevalence, accessed at https://knoema.com/atlas/Saint-Kitts-and-Nevis/Male-obesity-prevalence

[92] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

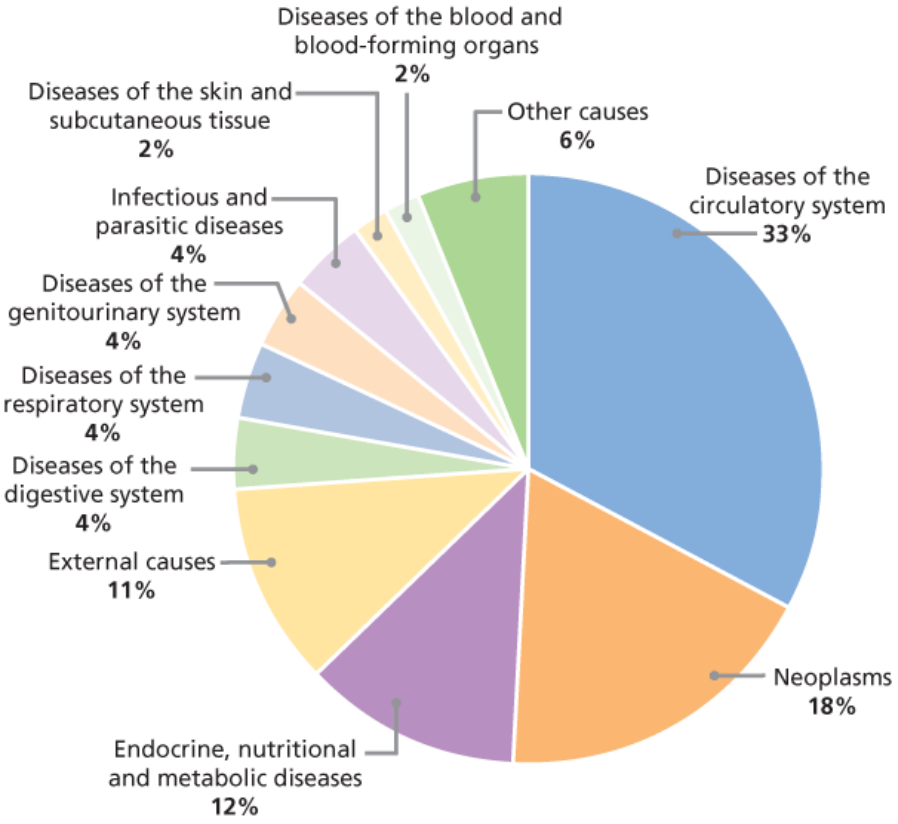
[93] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

Table 5-19. Persons Suffering from Chronic Lifestyle Diseases by Sex and Quintiles 2007/08

Suffer Chronic Disease		Per Capita Consumption Quintiles					
		Poorest	II	III	IV	V	Total
		%					
Male	Yes	7.3	9.7	12.9	11.9	19.8	12.3
	No	92.7	90.3	87.1	88.1	80.2	87.7
	Total (100%)	4,889	4,628	5,074	4,526	4,824	23,941
Female	Yes	13.6	13.8	18.5	17.6	29.9	18.6
	No	86.4	86.2	81.5	82.4	70.1	81.4
	Total (100%)	5,227	5,534	5,021	5,584	5,293	26,659
Both Sexes	Yes	10.6	11.9	15.7	15	25.1	15.7
	No	89.4	88.1	84.3	85	74.9	84.3
	Total (100%)	10,116	10,162	10,094	10,110	10,118	50,600

Source: PAHO

The figure below shows the leading causes of death in SKN as of 2012.



Source: PAHO Health Information Platform (PHIP).

Figure 5-52. Leading Causes of Death, 2012

As of June 2020, Nevis had reported four confirmed cases of COVID-19 and zero deaths, with no active cases reported since May 2020.[94] The country has been in a state of emergency because of the COVID-19 situation since Saturday March 28. The state of emergency was extended for six months on April 17, and included measures such as nightly curfews and stay-at home orders.[95]

Main Diseases in ADI

The main diseases in the ADI correspond to those described in the section above for the island of Nevis. Further, in 2017 in Charlestown, there were 2,269 infant visits at health centers, up from 765 in 2016 (Nevis Health Promotion Unit). In 2017, there were also 519 toddler visits at health centers in Charlestown (Nevis Health Promotion Unit). In 2016, there were 147 registered diabetic patients in Charlestown health centers, from a total of 479 in Nevis, constituting 31% of diabetic patients on the island (Nevis Health Promotion Unit). In 2016 there were 114 registered hypertensive patients in Charlestown health centers, from a total of 526 in Nevis, constituting 22% of hypertensive patients on the island (Nevis Health Promotion Unit). In 2016, the Alexandra Hospital carried out 384 HIV/AIDS laboratory tests, with one coming back positive (Nevis Statistical Digest, 2018). In 2017, the Alexandra Hospital carried out 455 HIV/AIDS laboratory tests, with one coming back positive (Nevis Statistical Digest, 2018).

5.4.6.2 Fertility and Infant Mortality

Maternal mortality is limited to 1–2 cases per year. Women receive free antenatal care, including laboratory services, in public health facilities, and all births are assisted by skilled health personnel (PAHO/WHO). Specialized services are provided in the primary care setting, and there is a focus on early identification and management of high-risk clients. Regular clinic hours have been extended to accommodate pregnant women.[96]

Table 5-20. Fertility and Infant Mortality Statistics in St Kitts and Nevis

Indicators	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Maternal mortality per 100,000 live births	0	151.0	0	141	0	152.4	150.2	314.5	0	156.0
Infant Mortality Rate	13.5	21.1	20.3	14.1	20.0	18.3	12.0	9.4	18.3	21.8

Source: CARICOM, St. Kitts and Nevis Statistics

There are no data disaggregated to the Charlestown or parish level on fertility and infant mortality rates.

5.4.6.3 Health Infrastructure

As a two-island federation, there are two ministries of health with parallel organizational structures. Each island has a Minister and Permanent Secretary who are responsible for organizing and managing public

[94] The Caribbean Journal, The Island of Nevis Says it is Coronavirus Free, May 10 2020, accessed at https://www.caribjournal.com/2020/05/10/nevis-coronavirus-free/).

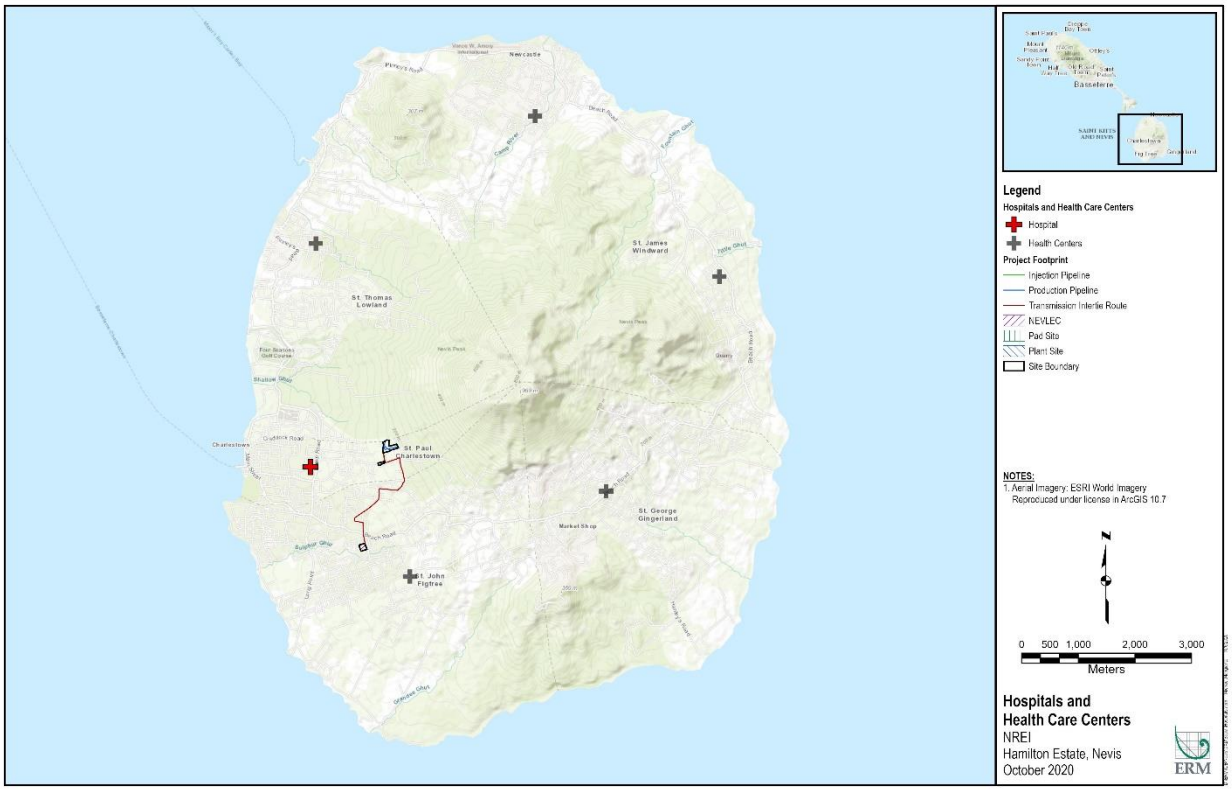
[95] Garda, St Kitts and Nevis: Government extends curfew measures through May 9, Garda World, accessed at https://www.garda.com/crisis24/news-alerts/338166/st-kitts-and-nevis-government-extends-curfew-measures-through-may-9-update-3

[96] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

health services. Each Ministry is organized into three programs: the Office of Policy Development and Information Management, which includes the health information unit; Community-Based Health Services, which includes family health services, environmental health, and health promotion; and Institution-Based Health Services, which includes patient care services. There is a single Chief Medical Officer for the Federation who is responsible for oversight of scientific and technical matters pertaining to public health policy, health status monitoring, and regulation of health professionals. Nurses are regulated by the Principal Nursing Officer and by the St. Christopher and Nevis Nurses and Midwives Council.[97]

The primary health care system is now well developed and is anchored on health centers (of which there are five in Nevis) that provide for immunization, antenatal clinics, family planning, chronic disease management and child health surveillance, along with other services. The country is able to provide for much of its secondary care needs. Tertiary care has to be sought in the United States, Puerto Rico, Trinidad and Tobago or Barbados (CPA).

The Figure below shows the five health centers and one hospital in Nevis:



Source: ERM, 2020

Figure 5-53. Location of Health Centers and Hospitals in Nevis

Complementing government-funded access to health care services for children and the elderly is a system of social protection that includes social insurance (Social Security) and safety net programs. Children under the age of 18 and persons over the age of 62 years are exempt from charges at public health services for basic health care; these services are not withheld for other groups due to inability to pay.[98] The Social

[97] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

[98] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298

Security System continued to meet its obligations during 2010–2015, with the number of beneficiaries receiving assistance benefits increasing from 15,828 in 2010 to 18,501 in 2015 (16.9% increase). Payments to beneficiaries increased by 61.8%, from US$ 15.4 million in 2010 to US$ 24.9 million in 2015. There are also subsidies that apply to health and education services.[99]

An indicator of the level of healthcare resources of the population is the number of beds available per 1000 people, which has been estimated to be 7.9 beds per 1000 people nationally in 2012 (Nevis Statistical Digest, 2018).

For the ADI, the health infrastructure in Charlestown includes Alexandra Hospital, with 52 beds (PAHO).

Table 5-21. Resources of the National Health System in Nevis

Island	Physical Resources				
	Hospitals	Health Centers	No. of hospital beds	No. of infirmary beds	No. of total beds x 1000 people
Nevis	1	5	52	38	7.9

Sources: Pacific Prime https://www.pacificprime.com/country/americas/saint-kitts-and-nevis-health-insurance-pacific-prime-international/ and Nevis Statistical Digest (2018)

Another indicator of the level of healthcare resources of the population is the number of physicians available per 1,000 people, which has been estimated to exceed 2.3 physicians per 1,000 people nationally in 2015 (PAHO). Of the 118 physicians registered in 2015, 21% worked in the public sector and 32% worked in both the private and public sectors (PAHO). As of 2015, SKN also counted over 3.6 nurses per 1,000 people.

Table 5-22. Resources of the National Health System in the Nevis

Island	Human Resources (2015)		
	No. of physicians x 10,000 people	No. of dentists x 10,000 people	No. of nurses x 10,000 people
St Kitts and Nevis	23.3	3.5	36.6

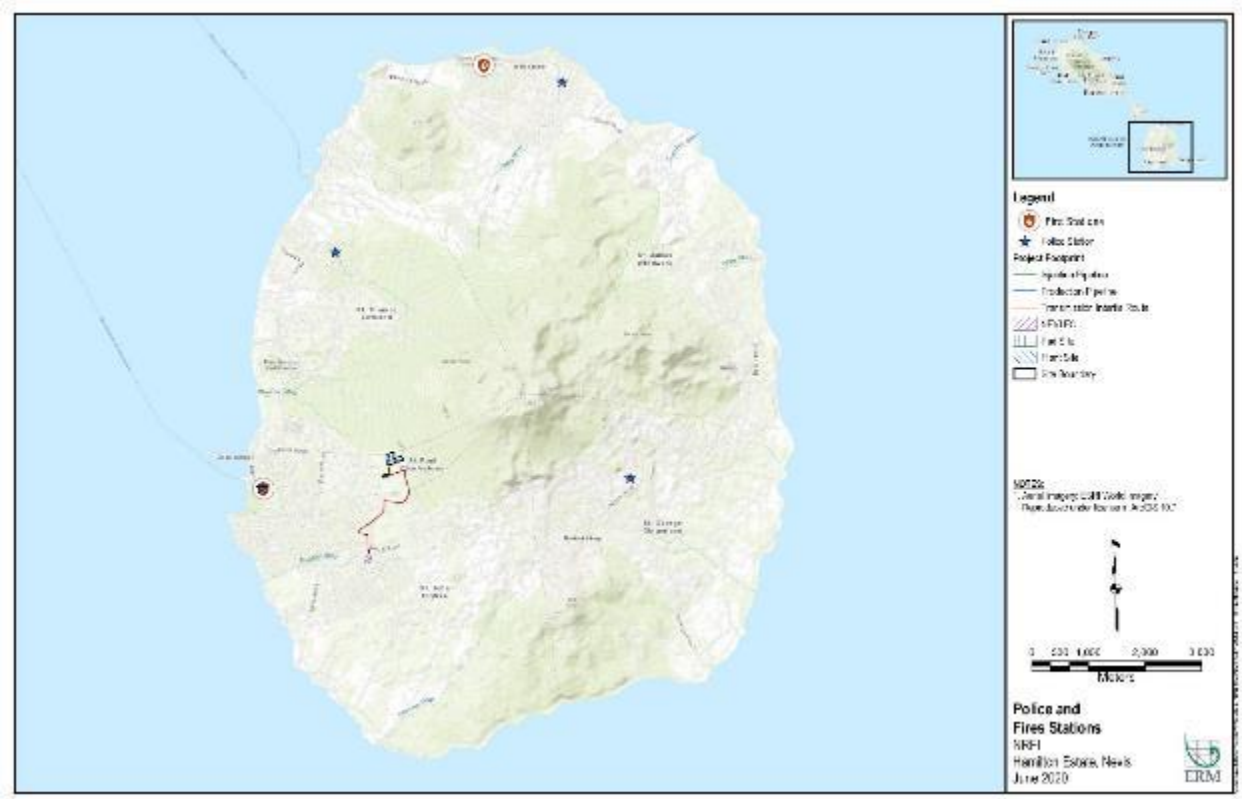
Sources: PAHO/WHO

There are no data disaggregated to the Charlestown or parish level on the number of physicians, dentists and nurses.

5.4.6.4 Emergency Services

There are four Police Stations and two Fire Stations on the island. Of the two fire stations, the main one is adjacent to the Charlestown Police Station (in the ADI) and the other is located at the Vance W. Amory International Airport in Newcastle (Nevis Statistical Digest, 2018). The other police stations are in Cotton Ground, New Castle and Gingerland.

[99] PAHO, Health in the Americas, St. Kitts and Nevis accessed at https://www.paho.org/salud-en-las-americas-2017/?p=4298



Source: ERM, 2020

Figure 5-54. Police and Fire Stations in Nevis

In 2013, there were a total of 125 fires registered by the Fire & Rescue Services. Of those, the majority (50) were garbage fires, followed closely by grass and bush fires (47) (Fire & Rescue Services, Nevis). Other types of fires include house fires, tires catching on fire, kitchen fires, electrical fires and motor vehicle fires.

5.4.6.5 Security

Control Risks' SKN Country Profile reports that the presence of illegal weapons (mostly low-calibre pistols) from the US and low-level drug dealing in the country's urban areas, mainly the St. Kitts capital Basseterre, have led to an increase in gang activity, mostly linked to increases in business robbery and petty theft. However, local gangs are small and isolated from transnational criminal organizations, which means gang-related violence is only sporadic (Control Risks Country Profile). Violence is disproportionately concentrated in low-income neighborhoods, affecting mainly young, male local residents (Control Risks Country Profile). Most of the homicides registered in the country tend to be gun-related (Control Risks Country Profile). Common and opportunistic crime will likely remain the principal threat to business and personnel in the country.

While the local police (SCNPF) is underfunded and understaffed, the government has made significant efforts to revamp their anti-crime strategy (Control Risks Country Profile). Moreover, security spending has also significantly increased over the past few years – the 2020 National Security budget is USD 36.7m (Control Risks Country Profile). The local population tends to distrust the police, though this is more a consequence of their perceived inefficiency than of any known links to corruption or organized crime (Control Risks Country Profile).

According to International SOS, petty crime represents the main risk to travelers in SKN, but rates are low. Incidents of burglary, armed robbery and assault have been known to take place, along with the normal petty crime. Although crime is generally confined to low-income neighborhoods, no area is crime-free. Statistics released by the government indicate that crime rates overall decreased 27% in 2019, including a 48% decrease in homicides, especially those linked to gang violence (International SOS Country Profile). According to officials, the reduction in crime marked a historic low in 14 years. The decrease in crime is a result of the government's Peace Initiative in February 2019, according to which the authorities and gang members engaged as the former assisted in supporting gang members settle in a different lifestyle (International SOS Country Profile). In addition, the government increased budgetary allocation for security solutions including training, forensics and equipment (International SOS Country Profile). In 2020, the police reported a 41% decrease from January to 18 April, and a 78% reduction in major crimes such as homicides, shootings, robberies and sexual assault (International SOS Country Profile). Further, the threat of transnational terrorism in St Kitts and Nevis is low and there are no known domestic terrorist organizations (International SOS Country Profile). Protests occur occasionally and rarely turn violent (International SOS Country Profile).

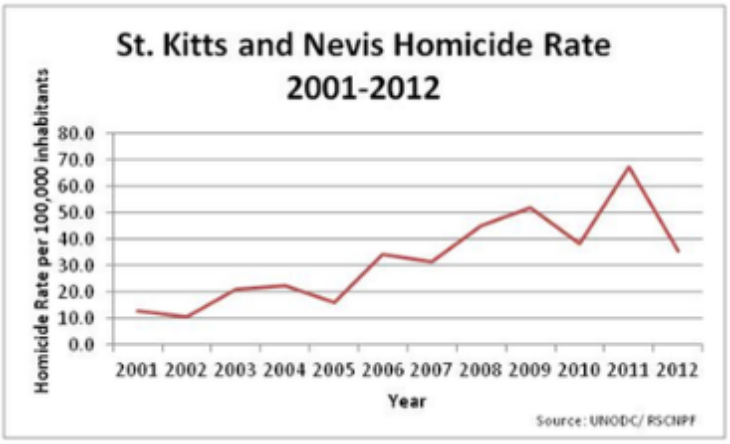
The Nevis Statistical Digest (2018) provides a breakdown of different types of crime, from the period 2010-2017, in SKN, which is shown on the table below. The data are not disaggregated to the Nevis, Charlestown or parish levels.

Table 5-23. Crime in St. Kitts and Nevis 2010-2017

Crime Category	2010	2011	2012	2013	2014	2015	2016	2017
Murder	5	6	3	10	5	8	5	9
Attempted Murder	3	0	0	1	2	0	2	6
Manslaughter	1	0	0	0	0	0	0	0
Wounding	15	17	7	19	9	8	14	3
Grievous Bodily Harm	2	0	1	2	0	0	0	1
Wounding with intent (Firearm)	6	7	2	5	7	7	5	2
Rape	1	1	5	3	1	1	6	2
Robbery / Armed Robbery	13	18	23	18	29	14	11	8
Burglary	48	14	21	34	10	6	10	1
Larceny	36	58	45	50	42	29	32	29

Source: Nevis Statistical Digest, 2018

Analyzing the SKN homicide rate per 100,000 inhabitants, the following figure shows a spike in homicides in recent years:



Source: UNODC/RSCNPF, accessed at https://issat.dcaf.ch/Learn/Resource-Library2/Country-Profiles/Saint-Kitts-and-Nevis-Country-Profile

Figure 5-55. Homicides per 100,000 Inhabitants

In 2011, when there were 34 homicides in SKN, the country had a murder rate of 67.6 per 100,000 inhabitants, one of the highest in the world.[100] Since then, however, the murder rate has dramatically decreased, as was stated above. In 2017, for example, the murder rate was 17.3 per 100,000 inhabitants (based on a 2017 population of 52,045 per the World Bank). According to data collected by the United Nations Office on Drugs and Crime (UNODC), the use of firearms in homicides in SKN rose from 2004-2010 from 63.6 percent of murders where guns were used to 85 percent.[101] The global average is 42 percent.

5.4.7 Human Rights

Significant human rights issues in SKN include criminalization of same-sex sexual activity between men, although the law was not enforced (US State Department, St. Kitts and Nevis 2019 Human Rights Report). Top government officials made public statements acknowledging that sexual orientation is a private matter and that all citizens have equal rights under the law (US State Department, St. Kitts and Nevis 2019 Human Rights Report). Further, the government has effective mechanisms to investigate and punish officials who abused human rights (US State Department, St. Kitts and Nevis 2019 Human Rights Report). There were no reports of prosecutions or arrests of government officials for human rights violations in 2019 (US State Department, St. Kitts and Nevis 2019 Human Rights Report).

During the last decade, SKN has made great advances in the promotion and the guarantee of children's rights. Particularly, in the areas of education, health, nutrition, access to drinkable water and its purification as well as in the fight for the respect of equality between human beings. Challenges remain in preserving the security and the health of children.[102] The Realization of Children's Rights Index (RCRI) is a grade between 0 and 10 that shows the level of realization of children's rights in a country. The lower the grade, the lower the realization of children's rights.[103] The RCRI takes the following elements in its calculation:

[100] International Security Sector Advisory Team, St. Kitts and Nevis Country Profile, accessed at https://issat.dcaf.ch/Learn/Resource-Library2/Country-Profiles/Saint-Kitts-and-Nevis-Country-Profile

[101] International Security Sector Advisory Team, St. Kitts and Nevis Country Profile, accessed at https://issat.dcaf.ch/Learn/Resource-Library2/Country-Profiles/Saint-Kitts-and-Nevis-Country-Profile

[102] Humanium St. Kitts and Nevis Country Profile, accessed at https://www.humanium.org/en/st-kitts-and-nevis/

[103] Humanium RCRI, accessed at https://www.humanium.org/en/rcri/

- Mortality for less than 5 years;
- Life expectancy at birth;
- Education;
- Poverty;
- Low birth weight;
- HIV;
- Child labor;
- Child marriage;
- Female genital mutilation;
- Registration of births;
- Ecological impact on the future of children;
- Rights and freedoms; and
- War and other violent situations.

For SKN, Humanium places the RCRI at 7.86, denoting "noticeable problems" with children's rights in the country.[104] Humanium identifies some of the main problems faced by children in SKN as:

- Minimal age of penal responsibility: children are penally responsible from the age of 8 years old, and young minors in conflict with the law are consequently faced with very long judicial procedures;
- Children incarcerated in prisons for adults, due to a lack of adequate holding places for children sentenced by the law;
- Corporal punishments are authorized by the code of justice in SKN, and a judge can sentence minors to whipping. It is also used as a disciplinary measure in prisons;
- Lack of aid for rehabilitation: imprisoned children generally do not have access to services of social reinsertion or programs of education; and,
- On average 200 cases of abuse are reported each year to services of protection of childhood for both St. Kitts and Nevis (UNICEF 2019). Of these, physical and sexual violence represent 20% and 8% of these cases. The majority of cases (62%) are cases of negligence.

According to Humanium, UNICEF describes the number of minor victims of sexual abuse as alarming, but women and their daughters rarely inform on the sexual abuse perpetrated by the men of their family because they depend financially on them.[105] Further, Humanium states that violence against girls comes mainly from the fact that the men and boys of SKN traditionally hold a discriminatory and negative attitude towards women and girls. Data for SKN, however, shows that there has been a reduction in teen pregnancies between 2006 (20.4% of total births) and 2011 (14.5% of total births) (Country Gender Assessment, 2014).

During 2010 to 2017, the Nevis Family Service Division received an average of 39 reports of child abuse. This ranged from a maximum of 66 in 2010, to a minimum of 16 in 2014. From 2012 to 2017, the Nevis Health Promotion Unit has registered an average of nine cases per year of injuries related to sexual assault.

[104] Humanium St. Kitts and Nevis Country Profile, accessed at https://www.humanium.org/en/st-kitts-and-nevis/

[105] Humanium St. Kitts and Nevis Country Profile, accessed at https://www.humanium.org/en/st-kitts-and-nevis/

Teen pregnancies in Nevis have ranged from 8.7% to 16.8% between 2010 and 2016 (Nevis Health Promotion Unit). [106]

Further, according to data from OPS/OMS referenced by Humanium, between 2007 and 2010 deaths by homicide represented 46% of deaths of children aged between 15 and 19 years old in SKN, which was higher than deaths from traffic accidents or suicide.

For information on gender, see Section 5.4.9.

5.4.8 Landscape Aesthetics

Nevis is dominated by a single, volcanic edifice surrounded by a wide expanse of gently sloping land that uniformly spreads towards the sea. Visible intrusions or changes in the landscape are a particularly sensitive issue for Nevis, where the economy depends on tourism.

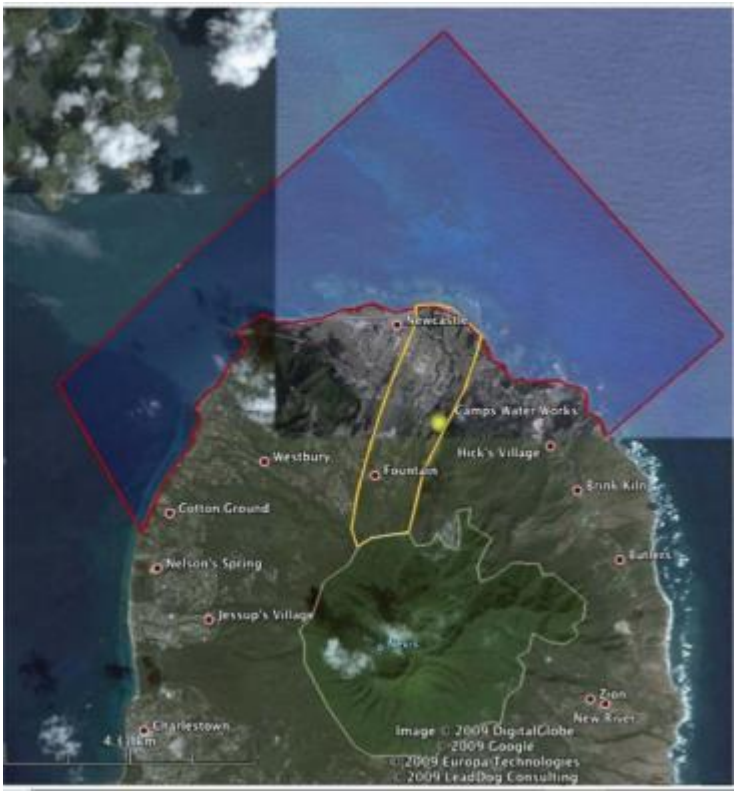
Source: Marinas.com, accessed at https://marinas.com/view/harbor/mpt8wl_Charlestown_Harbor_Charlestown_Nevis_Island_Saint_Kitts_and_Nevis#&gid=1&pid=1

Figure 5-56. Nevis Landscape

Due to human development, very few untouched areas remain on the island. With increasing realization of the importance of careful management to help ensure sustainable development, there has been greater emphasis placed on the implementation of policies and guidelines backed by laws to enforce a more careful management of the land (Casey D. Allen, Landscapes and Landforms of the Lesser Antilles, 2017).

[106] It is important to note that a study by NCH/UNICEF on Social Services Delivery discovered an alarming variance in child abuse statistics depending on the source of information for SKN (The Status of Child Protection in St. Kitts/Nevis, UNICEF).

The Bath Hotel (see location in Figure 5-59.) has been deemed a protected area on Nevis, and all land above the 300 m contour on Nevis is protected through administrative means, with plans to establish a Nevis Peak Park to encompass this area (Allen 2017). In 2009, the SKN government presented a Protected Area Management Plan for the Proposed Nevis Peak National Park and Camps River Watershed Area (see Figure 5-53).[107] The development of the Protected Areas Management Plan for Nevis Peak National Park and Camps River Watershed Area was supported by the OECS Environment and Sustainable Development Unit, in partnership with the USAID, through the OECS Protecting the Eastern Caribbean Region's Biodiversity (PERB) Project.



Source: Protected Areas Management Plan for Nevis Peak National Park and Camps River Watershed Area

Figure 5-57. Proposed Protected Areas[108]

As can be seen in the Figure above, the Project Footprint and ADI would not overlap with any of these proposed protected areas. The government's goal in establishing these protected areas is to ensure the survival of natural resources.

The Project Footprint is on the lower flanks of the Nevis Peak, approximately 1.5 miles from Charlestown on the western side of the island, at elevations between 500 and 610 feet above sea level. It is not on an industrial site, but instead occupies part of the Hamilton Estate, a former sugarcane plantation, characterized by low-lying scrub vegetation. It is approximately 1,300 feet west of outlying residential areas of Charlestown, and is surrounded by vegetation and a few scattered residences and buildings. The closest

[107] Federation of St. Kitts and Nevis, Protected Area Management Plan for the Proposed Nevis Peak National Park and Camps River Watershed Area, 2009 accessed at http://caribbean-rris.biopama.org/sites/default/files/2019-03/Nevis_Peak_National_Park_Management_Plan_2009.pdf

[108] The red outline represents the boundary of Nevis' coastal and marine protected area; the yellow outline is the approximate boundary of Camps River's proposed protected area; the green outline is a 300-meter contour boundary proposed for the Nevis Peak Park.

residences are within 0.5 miles of the Project. The areas north and northeast of the Project are completely undeveloped. The main access to the former plantation area is an unpaved road that runs past the injection well, former sugar works, and existing apartment buildings, and connects to other back roads on the south side of the island.

The main road to Church Ground and Stoney Hill on the southern side of the island is approximately 0.8 miles south of the site. Travelers along the public road to the sugar works have brief views of the injection well drilling and pipeline construction sites on their way to other portions of the Hamilton Estate. Views from residences west (downslope) of the plant site are largely screened by existing trees and other scrub vegetation.

Charlestown and the coastal communities of St. Paul Charlestown Parish and St. Thomas Lowlands Parish are more than 1.5 miles from the proposed Project site. As with the residences described above, views of the Project site from these coastal communities would also be screened by vegetation and structures. The transmission line would be underground, and its route would primarily be visible to immediately surrounding land uses, including some residences in Hamilton Estate, Blazier Estate, Marion Heights and Stoney Grove.

Figure 5-2. Land Use in ADI provides images of vegetation in the Project Footprint, while the Figure below shows the current visual status of the Project. For more details, see Chapter 5.3 Biodiversity Baseline and Chapter 6 Impacts.

Source: NREI

Figure 5-58. Current Project Landscape

5.4.9 Social Assessment and Gender Analysis

Gender equality contributes to poverty reduction and results in higher levels of human capital for future generations. The IDB's Operational Policy on Gender Equality in Development states that empirical evidence in this regard is overwhelming: equality within the household, in the labor market, in access to financial services and technology, and in civic and political participation reinforce one another and contribute to the effectiveness of development efforts (IDB Operational Policy on Gender Equality in Development, "Gender Policy", 2010). Equality between men and women also has intrinsic value, and is firmly supported by the governments of Latin America and the Caribbean. SKN has backed the Universal Declaration of Human Rights (1948), the Convention on the Elimination of All Forms of Discrimination against Women or CEDAW (1979), the Inter-American Convention on the Prevention, Punishment, and Eradication of Violence against Women (1994), the Program of Action of the International Conference on Population and Development (1994), the Platform for Action of the Fourth World Conference on Women (1995), and the Millennium Development Goals (2000). The IDB's Gender Policy was approved in November 2010 and entered into effect in May 2011. The Gender Policy aims to improve the IDB's ability to support its member countries' goals and commitments to gender equality and women's empowerment. It commits the IDB to undertake both proactive and preventive actions, and sets out monitoring mechanisms.

The St. Kitts and Nevis Country Gender Assessment (2014), commissioned by the Caribbean Development Bank, provides a snapshot of the country's position regarding gender equality. The assessment provided a gender analysis of the economic, social and governance sectors in St Kitts and Nevis and the findings revealed a national statistical gender profile where women slightly outnumber men by 1.4 and 2% in St. Kitts and Nevis respectively. Females outlive men, with life expectancy for males at 73 years and for females, 76.8 years (CDB's Country Gender Assessment, 2014). Females were more likely than males to be among the indigent in St. Kitts; however, in Nevis, it was among men that the non-indigent poor and vulnerable were found. Within the Federation, women's labor force participation rates were lower than men. The percentage of women in politics remained small, at 20% (CDB's Country Gender Assessment, 2014). These issues will be discussed in more depth below.

5.4.9.1 Roles and Responsibilities

Occupational segregation between men and women may imply different opportunities and needs. For instance, projects looking to provide trainings in highly segregated sectors may find few men/women in that specific sector and underserve a specific gender group (for more details, see Section 5.4.9.2). There is need to overcome the ingrained male chauvinism which informs the relationship between males and females (St Kitts and Nevis Millennium Development Goals, 2006). According to the St Kitts and Nevis Millennium Development Goals (2006) there are still many men who are threatened by the upward mobility of women in the country.

St. Kitts and Nevis is a patriarchal society where power structures are dominated by males, consequently, some of the privileges associated with power are not open to females (Twenty-fifth anniversary of the Fourth World Conference on Women and adoption of the Beijing Declaration and Platform for Action, St. Kitts and Nevis Country Report 2013-2018 [2019], from now on "BCPA Country Report"). Embedded socio-cultural attitudes and behaviors perpetuate ideas and practices along patriarchal gender lines which create disadvantages that affect the life chances of women (CDB's Country Gender Assessment, 2014). Traditional, religious beliefs often reinforce negative stereotypes and serve to promote acceptance and continuation of discrimination. Cultural roles of men and women, and the issues arising from gender roles

assigned by society are evident (BCPA Country Report). For example, data from the St. Kitts Nevis Social Security Board reveal little change in gendered patterns of employment over the period 2010 to 2017 (BCPA Country Report). During that period, 60% of women were employed in the manufacturing sector, 60-61% in hotel and restaurant occupations, 70-73% in health and social work; and 70% in financial intermediary roles (BCPA Country Report).

Government priorities for accelerating progress for women and girls during the period 2013-2018 include the implementation of a National Social Protection Strategy, strengthened by a National Household Registry to improve case management of persons accessing public assistance (BCPA Country Report). The Poverty Alleviation Programme improves the socio-economic status of disadvantaged families who are assisted with a monthly stipend to meet essential living expenses (BCPA Country Report). Violence against women and girls has been addressed through legislation, specifically the Domestic Violence Act, 2014. The Special Victims Unit of the Royal St. Christopher Police Force is a dedicated facility staffed by specially trained officers who identify and investigate allegations that occur within the family (BCPA Country Report).

Improvements in healthcare include the Elimination of Mother to Child Transmission of HIV and Syphilis; prevention programs for HIV/AIDS and Non-Communicable Diseases (NCDs), and programs targeted at women's health matters (BCPA Country Report). Gender sensitization training across the Federation in 2017 resulted in the identification of 116 gender focal points (BCPA Country Report).

Women who experience multiple and intersecting forms of discrimination include: women living with AIDS/HIV, women living with disabilities, younger women, older women; and migrant women (BCPA Country Report). Preventative measures dealing with these groups include educational programs targeted at sex workers and females involved in transactional sex; the drafting of a Special Needs Policy and Action Plan; and services geared towards teen mothers to enable them to complete their secondary education (BCPA Country Report). In relation to access to sexual and reproductive health for girls (under 18 years), current legislation does not permit access to these services without parental consent (BCPA Country Report). 'Sexual and reproductive health and reproductive rights' is a contentious issue because under the Federation's legislation abortion is illegal, with the exception of rape or the need to save the mother's life (BCPA Country Report).

The BCPA Country Report also states the following:

> "Primary and secondary health care is delivered by the Ministry of Health through community based health services and institutional based facilities. Clinic services available include pre-natal and antenatal care, women's health, family planning, immunization, child health surveillance, chronic disease management, voluntary counselling and testing for HIV/AIDS and sexually transmitted diseases. Antenatal services are accessed routinely by pregnant women in St. Kitts and Nevis; these services include prevention of vertical transmission of HIV and Syphilis. Pregnant women have at least two HIV and syphilis tests, usually in the first and third trimesters. Individuals with HIV/AIDS have access to care and provision of anti-retrovirals is free. The National AIDS Programme has developed a working relationship with vulnerable groups involved in prostitution, delivers programs, and educates on human rights, tolerance and choices. Sex workers and females who exchange sex for money receive education about HIV, Sexually Transmitted Infections (STIs) and condom use, and benefit from the distribution of condoms and lubricants. The Sister Programme looks at AIDS and STIs and is geared towards women in a vulnerable position and who engage in transactional sex. The Programme identifies and works with peers, adopting an 'each one, reach one' approach where 'sisters inform sisters'.

Developments in sexual and reproductive health have resulted in improved maternal health, reduced teenage birth rates, and a protocol for Zika virus management in pregnancy and neonatal care. St. Kitts and Nevis marked a major achievement in 2017 with the eradication of mother to child transmission of HIV and syphilis, as validated by PAHO and WHO. However, women are disproportionately affected in the incidences of non-communicable diseases (NCDs). The Health Promotion Units on both St. Kitts and Nevis take an active role in educating and raising public awareness of health issues. The Ministry of Health implemented a number of programs to address this national health concern. In 2017 the NCD Program launched the Women's Health Improvement Plan (WHIP), a program geared to empower and educate women on how to effectively manage their health and wellbeing. A further example is the Chronic Disease Self-Management Programme (CDSMP) or "Living Healthy" Programme created by Stanford University and introduced to the Ministry of Health by PAHO. In 2018 a number of persons were trained to facilitate community workshops, open to the general public and targeted at individuals diagnosed with, or have risk factors of a chronic non-communicable disease."

5.4.9.2 Resources, Assets and Opportunities

Men's and women's traditional roles may affect their possibility to control household income and assets, have access to markets and educational opportunities. In SKN, in terms of education, females (97.4%) have higher literacy rates than males (96.5%) amongst the 15-24 age range (CDB's Country Gender Assessment, 2014). Females had higher completion rates of primary and secondary level education, at 32.5% and 52.5% respectively, compared with 24.1% and 51.6% for males (CDB's Country Gender Assessment, 2014). Although females outperform their male counterparts at school and college level, men have a higher completion rate at university level (11%) (CDB's Country Gender Assessment, 2014). At tertiary level female students continue to display a propensity toward traditional gender-biased subjects, which suggests the prevalence of entrenched social and cultural relationships (BCPA Country Report). Data from the Clarence Fitzroy Bryant College reveal that female students drop out at greater rates than their male counterparts in year 2 (BCPA Country Report).

The interruption of girls' education through the high rate of teenage pregnancy was a major issue. The Country Strategy Paper 2013-2016 for SKN identifies two critical issues which relate especially to technical vocational education and training: "inadequate demand-driven education programs" and "gender disparity in the provision not adequately addressed". The White Paper on Education Development and Policy 2009-2019 "acknowledges that there are gender issues in training and that too many people perceive there to be separate training courses for men and women". The related strategic plan is cited as an opportunity to "improve gender equity", but no specific objectives, strategies or activities are stated (CDB's Country Gender Assessment).

With regard to employment, women in Nevis have a lower rate of labor force participation than men (66.3% for women versus 76.2% for men) and higher rates of unemployment (8.3% for women versus 8.1% for men), according to the CDB's 2014 Country Gender Assessment. Women's average wages are also lower than men's, averaging XCD 28,079 for women versus XCD 30,123 for men (Country Gender Assessment, 2014). The Country Gender Assessment states that the country is still recovering from the 2005 closure of the sugar industry, which adversely affected some 12% of the labor force, especially women who had less marketable skills than men and therefore continue to face problems of adjustment. However, it should also be noted that there are sections of the population, including women, who are benefiting from the liberalization of the economy. Through the Citizenship by Investment Programme, for example, funding is being made available to small business investors through the Small Enterprise Assistance Fund (SEAF).

Women are among the forty-five (45) service providers, all lawyers, who represent applicants to the Citizenship by Investment Programme. Some 50% of lawyers registered with the SKN Bar Association are females, so the opportunities are equally open to either sex. Men however dominate the real estate sector as developers. The following table shows employment in SKN by gender and sector in 2012.

Table 5-24. Employment by Gender and Sector (2012)

Sector	Males	Females	Total
Agriculture, Hunting, Fishing, Forestry	282	79	361
Manufacturing (including Mining and Quarrying)	865	1304	2169
Electricity, Gas and Water Supply	223	92	315
Construction	2497	257	2754
Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles, Personal and Household Goods	1519	1977	3496
Hotel and Restaurant	1381	2229	3610
Transport, Storage and Communications	812	768	1580
Financial Intermediation	371	873	1244
Real Estate, Renting and Business Activities	797	786	1583
Public Administration and Defense; Compulsory Social Security	2846	4015	6861
Education, Health and Social Work	421	696	1469
Other Community, Social and Personal Service Activities	770	699	1469
Private Household with Employed Persons	176	282	458
Extra-Territorial Organization and Bodies	1	3	4

Source: Ministry of Sustainable Development, 2013

The table shows that, while for the country as a whole, the main employment sectors are tourism, construction and public administration (See Section 5.4.3.4 Main Industry Sectors), for women the main employment sectors are public administration, tourism and the “wholesale and retail trade; repair of motor vehicles, motorcycles, personal and household goods” category.

The 2010 business profile for SKN indicates that 57.8% of the 150 firms surveyed have female participation in ownership; 21.1% have a female top manager; 43.3% of permanent full-time workers are females; and across all firms, access to finance, tax rates and electricity charges are the main barriers in the business environment (International Finance Corporation, World Bank (2010), Enterprise Surveys – St. Kitts and Nevis Country Profile 2010). The CDB’s Gender Assessment, however, lists many other gender-based obstacles facing women, including those related to the nature of the labor market, such as: “occupational and industrial segregation, time, poverty and skills”; and strong socio-cultural factors, including the “current mind-set” of both women and men “that women can only ‘handle’ certain areas, closely associated with the household and devalued in terms of power”. In 2005, it was estimated that female-owned businesses in SKN were 25%. With regard to tourism, one of the major employment sectors in the country, the sector presently has a high concentration of women mainly in housekeeping, reception, and food and restaurant

services (CDB's Country Gender Assessment, 2014). Although men are said to be needed as waiters, they are not attracted to this occupation (CDB's Country Gender Assessment, 2014). The St. Kitts Tourism Authority provides training for service providers – mainly men – as taxi and tour operators. Training for women is targeted in areas such as massage therapy and hair braiding.

The CPA data shows that males have a much higher level of housing assets than females, although there is a higher proportion of female headed households and with larger family sizes compared to male headed households. The National Housing Corporation (NHC) receives Government or 'crown lands' for housing and therefore is able to construct at lower costs. Under the H500 housing program, of three hundred and fifty-one (351) units built, two hundred and fifty-eight (258), or 73.5%, were allocated to female heads, seventy four (74), or 21.1 %, to male household heads and nineteen (19), or 5.4%, to joint male and female owners.

5.4.9.3 Practices and Perceptions

Traditionally held beliefs about the interaction between men and women in public settings may affect gender equality. Norms around age of marriage & childbearing practices, or the social construction of manhood/womanhood may limit men's/women's ability to participate in the economy. The social constructions of manhood/womanhood may have an impact on gender-based violence, sexual and reproductive health, maternal health and HIV/AIDS. As discussed above, in Section 5.4.9.1, embedded socio-cultural attitudes and behaviors in SKN perpetuate ideas and practices along patriarchal gender lines which create disadvantages that affect women (BCPA Country Report). Traditional, religious beliefs often reinforce negative stereotypes and serve to promote acceptance and continuation of discrimination, and Nevis' population is highly religious (See Section 5.4.2.6 Religion). Therefore, cultural roles of men and women, and the issues arising from gender roles assigned by society are evident (BCPA Country Report).

In SKN, the involvement of young men in crime and violence, in gangs and the drug trade, and their perpetuation of violence against women in its various forms is of great concern in St. Kitts and Nevis. With regard to gender-based violence, in 2008 there were zero reported cases of gender-based violence towards men, and 46 reported cases per 10,000 women (CDB's Country Gender Assessment, 2014). However, in the case of Nevis, the reporting of domestic violence is said to be almost non-existent because there is no opportunity for confidential reporting and the Gender Affairs Department does not have the capacity to address this deficiency (Country Gender Assessment, 2014). There are also no shelters for survivors in either St. Kitts or Nevis. Penalties for conviction of domestic violence go up to XCD 13,500 (approximately 5,000 USD) or six months in prison (CDB's Country Gender Assessment, 2014). The Nevis Statistical Digest (2018) includes information of reported cases to the Family Service Division of domestic issues at the Nevis level, ranging from 2010 to 2017. The maximum cases reported were 12 in 2010, and the minimum was zero in 2017, with an average of about five cases reported each year. Further, the Nevis Health Promotion Unit has registered an average of 11 cases per year from 2012 to 2017 of injuries related to domestic violence.

A Special Victims Unit (SVU) within the Royal Saint Christopher and Nevis Police Force was created in 2012 (BCPA Country Report). Headed by a female officer, and staffed by six officers in total; five of which are female (83%), the SVU works closely with the Ministry of Social Services, and deals with issues including domestic violence and child abuse (BCPA Country Report). Officers are specially trained to identify and investigate allegations that occur within the family (BCPA Country Report). Since the establishment of the Unit there has been a significant increase in the reporting of cases of rape due to greater awareness (BCPA Country Report).

Further, in 2018, the development of the Domestic and Sexual Violence Complaints and Response Protocol was a significant achievement which was made possible through the Government of SKN, in partnership with PAHO and the United Nations Development Fund for Women (UNIFEM) (BCPA Country Report). The

Department of Gender Affairs has responsibility for the protocol, which formally sets out the roles and responsibilities of the key agencies involved in service provision (BCPA Country Report). The protocol was officially launched in November 2018 (BCPA Country Report). The Department of Gender Affairs, in partnership with the National Women's Council and National Men's Council works with men and women inside and outside of prisons, delivering training sessions aimed at changing the mindsets and behaviors of men and women to eradicate gender based violence in society (BCPA Country Report). One such example is the Department of Gender Affairs collaboration in 2018 with the Ministries of National Security and Education to use prisoners convicted of domestic violence to speak at public events and in schools to share their experience and encourage individuals not to follow the path into incarceration (BCPA Country Report). Furthermore, the Men's Programme at the Department of Gender Affairs includes a relationship skills program, the components of which include negotiation and effective communication skills (BCPA Country Report). There is also a violence intervention program, aimed at batterers, covering alternatives to violence, gender stereotypes discussions, the law, and anger management (BCPA Country Report). The Health and Family Life Education curriculum delivered in schools covers domestic/gender-based violence (BCPA Country Report).

However, prevailing attitudes towards child sexual abuse and domestic abuse often result in under-reporting of incidents. Factors that prevent women coming forward include fear of reprisals, embarrassment, economic and emotional dependence upon the abuser, stigma, belief that reports of child abuse would not be acted upon, and the length of the judicial process (BCPA Country Report).

Reported cases of child abuse have increased steadily (BCPA Country Report). The gender profile of abused children indicate that greater numbers of girls than boys experience abuse. The main reported cases of child abuse are neglect, physical and sexual abuse (BCPA Country Report). Significantly more girls than boys are affected by child sexual abuse: in the period 2012 to 2014 girls represented 80% of child sexual abuse cases, 55% of neglect cases, and 57% of physical abuse cases (BCPA Country Report).

According to the 2013 report on adolescent pregnancy by the United Nations Population Fund (UNFPA), approx. 19% of young women in developing countries become pregnant before age 19. Further studies conducted from 1990-2008 and 1997-2011 showed that "Latin America and the Caribbean is the only region where births to girls under 15 rose" and it is said that this trend is expected to continue to 2030 (CDB's Country Gender Assessment, 2014). There is a trans-generational problem of early child bearing in some families which puts many young females at the risk of teenage pregnancy (St Kitts and Nevis Millennium Development Goals, 2006). As a result there is a fatalistic attitude among young females in which they feel powerless to avoid early sexual initiation (St Kitts and Nevis Millennium Development Goals, 2006). In Nevis females who become pregnant in school are not afforded the same opportunity to return to school largely due to old cultural and religious norms which continue to discriminate against teenage mothers (St Kitts and Nevis Millennium Development Goals, 2006). However, there have been programs to reduce teen pregnancy. "Baby Think It Over" is a program aimed at teens to build awareness of the difficulties of pregnancy and the responsibilities of parenthood (BCPA Country Report). Nevisian Pearls is a closed group, counselling and social activities program for female students in secondary schools who are deemed at high risk of social influences (BCPA Country Report). Evolving problems are met with early intervention and the girls are able express themselves freely and build confidence in a supportive environment (BCPA Country Report).

Data for SKN reflected in the table below, indicates that a reduction has been taking place, including a dramatic 4.5% decrease from 2010 to 2011.

Table 5-25. Teen Pregnancies (2006-2011)

Year	Birth to teens (15-19 years) of % of Total Births
2011	14.5
2010	19.0
2009	19.1
2008	15.1
2007	15.2
2006	20.4

Source: Health in the Americas, 2012

5.4.9.4 Power and Decision-making

The CDB's Country Gender Assessment discusses that the issue of the low level of representation of women in leadership in politics, is one of the issues of deep concern among a wide range of stakeholders. SKN has a single National Assembly of fifteen (15) members, eleven (11) of whom are elected and three (3) appointed (two on the advice of the Prime Minister and the third on the advice of the Leader of the Opposition), and one (1) Ex officio (CDB Country Gender Assessment, 2014). Women's leadership in the political arena has remained very low over the years. Since Universal Adult Suffrage was secured in 1955, only three (3) females have been elected to political office, the first in 1984 after political independence was achieved in 1983. Of eleven (11) elected parliamentarians, eight (8) represent constituencies in St. Kitts and three represent seats for Nevis. In 2014, one female was among the eight (8) persons elected to seats for St. Kitts, while in Nevis one of the Ministries is held by a female. The Chairpersons of the governing St. Kitts and Nevis Labour Party (SKNLP) and the Opposition party, the People's Action Movement (PAM) were held by women in 2014. Historically, the women do most of the groundwork for the political parties but they have not been engaged at the highest level (St Kitts and Nevis Millennium Development Goals, 2006). A major factor in moving the discussion forward on practical measures to strengthen women's leadership and decision-making at all levels is the need for women's organizations and civil society more broadly to pursue advocacy with the GOSKN and political parties (CDB Country Gender Assessment, 2014).

In terms of public sector management, in Nevis male dominate positions both as Permanent Secretaries and as Heads of Department (see table below).

Table 5-26. Leadership in Nevis' Public Administration by Gender (2013)

Title	Male		Female	
	%	No.	%	No.
Permanent Secretaries	80	8	20	2
Heads of Departments	71.4	20	28.6	8

Source: Nevis Gender Affairs, 2014

The table below shows the data for leadership of statutory boards in SKN.

Table 5-27. Leadership of Statutory Boards in SKN by Gender (2013)

Statutory Boards	Male		Female		Total
	%	No.	%	No.	
Clarence Fitzroy Bryant College	66.7	4	33.3	8	12
Development Bank of St. Kitts & Nevis	71.4	5	28.6	2	7
National Housing Corporation, St. Kitts	57.1	4	42.9	3	7
St. Christopher Air & Sea Port Authority	66.7	6	33.3	3	9
St. Christopher & Nevis Social Security Board	61.5	8	38.5	5	13
St. Kitts & Nevis Accreditation Board	40.0	6	60.0	4	10
St. Kitts Electricity Company	87.5	7	12.5	1	8
St. Kitts-Nevis-Anguilla National Bank	55.6	5	44.4	4	9
St. Kitts Tourism Authority	77.8	7	22.2	2	9
Total	**61.9**	**52**	**38.1**	**32**	**84**

Source: CDB's Country Gender Assessment 2014

SKN's judicial system is administered through the Eastern Caribbean Supreme Court, which is headquartered in St. Lucia. At the highest level, it comprises the High Court of Justice and the Court of Appeal. At the local level it is led by High Court judges who sit on the Court of Summary Jurisdiction, Magistrates Courts, and the Office of the Attorney-General. SKN has shown signs of progress towards a representative judicial system. As of 2013, 133 persons, 73 (55%) males and 60 (45%) females, formed part of SKN's judiciary at all levels (CDB Country Gender Assessment, 2014). These include five presiding Magistrates, one (20%) male and four (80%) females, and three presiding Judges, two (67%) males and one (33%) female (CDB Country Gender Assessment, 2014).

Despite the strides made by women in education and their increasing numbers in administrative and managerial positions there is still the cultural mindset which continues to insist that women's roles must be secondary to men (St Kitts and Nevis Millennium Development Goals, 2006). A large number of men still regard the Department of Gender affairs as concerned exclusively with women's issues, although by developing father's groups throughout the country and focusing on men and their relationships there has been some change in this perception (St Kitts and Nevis Millennium Development Goals, 2006).

5.4.9.5 Law, Policies and Regulations

The policy and institutional framework for the promotion of gender equality and the empowerment of women are anchored in the nation's independence Constitution of September 1983 as well as in international treaties and related protocols to which the country is signatory, described above in Section 5.4.9 (CDB's Country Gender Assessment, 2014). SKN submitted its combined "Initial, Second, Third and Fourth report"

to the CEDAW Committee in 2002, following which no further report has been submitted. This means that accountability under CEDAW has been weak. The same is the case with the Inter-American Convention on the Prevention, Punishment and Eradication of Violence against Women (the "Belem Do Para" Convention) which SKN signed in 1995. An assessment in April 2011 through the fourth conference of States Parties on performance under the Convention concluded that, "St. Kitts and Nevis unequivocally does not have an action plan and/or strategy for the prevention, punishment and eradication of violence against women within the state …. No indication has been given as to whether a national action plan is in conception stages and/or if steps are being taken to formulate one" (CDB's Country Gender Assessment, 2014). This deficiency is linked to the weak institutional capacity of both Government agencies as well as civil society organizations (CDB's Country Gender Assessment, 2014). With regard to the Beijing Platform for Action and the Millennium Development Goals (MDGs), which were agreed by SKN in 1995 and in 2000 respectively, the Organization of Eastern Caribbean States has "localized" their implementation in the context of an MDG review conducted in 2006. The MDG targets were used as reference points to inform action planning for the various sectors, for example, the priority of poverty reduction and MDG 3 for addressing gender equality and the empowerment of women. Thinking around these international agreements and targets is therefore reflected in national policy instruments such as the GOSKN's 2005 Adaptation Strategy in Response to the New EU Sugar Regime 2006-2013, and its National Poverty Reduction Strategy (NPRS) 2011- 2015 (CDB's Country Gender Assessment, 2014). It also needs to be noted that the articulation of MDG3 in these key policy instruments was also shaped by the Government's wider national, regional and international commitments on gender equality (CDB's Country Gender Assessment, 2014).

In addition, SKN's Domestic Violence Act (2000) which went into effect in 2004 has a number of commendable features such as: (a) the absence of gender bias in that both males and females can obtain protection under any of the orders under the Act; and (b) imposing an obligation on the Police, where injuries have been suffered, to accompany a survivor of domestic violence to his/her home and for medical treatment if required (CDB's Country Gender Assessment, 2014). This legislation was updated in 2014. Further, in order to reduce the negative impact of teenage pregnancy, a Cabinet policy decision that established the right of teenage mothers to complete their education, was enforced in 1997 in St. Kitts and 2007 in Nevis, based on advocacy by the Gender Affairs Division. The country's Constitution as well as international legal commitments were used to advance advocacy for the measure, now regarded as international best practice.

Further, the National Social Protection Strategy (2012-2017) includes as one of its guiding principles "respect for human dignity, equality and human rights", and a core objective of moving from welfare to sustainable livelihoods. The report from Nevis on the implementation of the first phase of the National Social Protection Strategy (2012- 2015) is that much is being done on raising awareness and to encourage women in particular to use the court system for child maintenance and not to rely only on the social safety net system which provides EC $100 per child per month and a food voucher of EC $200 monthly. The program, called RISE (Restore, Inspire, Serve, Empower), is still being implemented for recipients to do parenting training – including training in life skills, budgeting and money management.

In summary, the CDB's Country Gender Assessment states that the legislative framework for the promotion of gender equality is quite enabling and in advance of the overall policy context, but that, however, there is a huge gap between the legal framework that supports gender equality, the implementation of the law, and the monitoring of its implementation.

5.4.10 Cultural Heritage Baseline

5.4.10.1 Prehistoric and Historic Context

The first archaeological chronology of the West Indies was developed by Irving Rouse. The most recent version of Rouse's chronology consists of three series (Ortoroid, Saladoid, and Ostionoid) divided into periods designated by roman numerals and letters (Rouse 1992). While Rouse's chronological framework is still generally utilized by Caribbean archaeologists today, it has been expanded upon and enhanced by more recent research (e.g., Wilson 2007).

Period Ia refers to the Casimiroid peoples who moved across the Yucatan channel into the islands of Cuba and Hispaniola during the time from approximately 4000 to 2000 BC. A second migration, originating this time in South America, occurred during Period Ib (ca. 2000 to 300 BC) and is associated with the Ortoroid peoples who moved into the Lesser Antilles, the Virgin Islands, and Puerto Rico, thus forming a frontier with the Casimiroids. The Ortoroids were replaced during period IIa (ca. 300 BC to AD 400) by the Cedrosan Saladoids, another migratory group from South America. The Cedrosan material culture persisted as an essentially homogenous unit until approximately AD 400 to 600.

After this time, two divergent Ostionoid subseries emerged: Elenan, evidence of which is found from Guadeloupe to eastern Puerto Rico, and Ostionan, which is found from western Puerto Rico to the eastern tip of Hispaniola. The Ostionans spread westward to southern Jamaica, eastern Cuba, and the central part of the Bahamian Archipelago during period IIIa (AD 600 to 900). A further divergence is seen in period IIIb (AD 900-1200), with the Ostionan culture of eastern Hispaniola evolving into the Chican culture, while those of the north-central part of the island developed into the Meillacan culture, which also spread through western Hispaniola, Jamaica, and Cuba.

It is during period IVa, from approximately AD 1200 to 1492, that a definite link can be made between the ethnic groups of the contact period and archaeological cultures. Chican culture spread in two directions: eastward through the Mona Passage and westward through most of Hispaniola. This is the territory classified by Rouse as belonging to the Classic Taíno, the most complex group (in terms of sociopolitical integration) indigenous to the islands of the Caribbean. The less developed Western Taíno and Eastern Taíno are thought of as directly related to the Meillacans and the Elanans, respectively.

Christopher Columbus is reported to have been the first European to sight the island of Nevis, in 1493. The first European to visit the island is unknown. In the 17th century, Nevis became a popular stop off point for English and Dutch ships on their way to the North American continent. Captain Bartholomew Gilbert of Plymouth visited the island in 1603, and Captain John Smith visited the island on his way to Virginia in 1607. On August 30, 1620, King James I asserted sovereignty over Nevis by giving a Royal Patent for colonization to the Earl of Carlisle. Actual European settlement did not occur until 1628, however, when Anthony Hilton brought 80 settlers to the island from Saint Kitts. An additional 100 settlers from London arrived shortly thereafter. Between 1675 and 1730, the island was the headquarters for the slave trade for the Leeward Islands. When the Leeward Islands were separated from Barbados in 1671, Nevis became the capital of the Leeward Islands colony. It remained the colonial capital until the capital was transferred to Antigua in 1698. In addition to the slave trade, Nevis' economy was based on the sugar industry in the 17th and 18th centuries. Slavery and the slave trade ended in Nevis with the abolition of slavery in the British Empire on August 1, 1834, while the sugar industry on Nevis extended into the 20th century.

Nevis was united with Saint Kitts and Anguilla in 1882, and they became an associated state with full internal autonomy in 1967. Anguilla seceded in 1971, and Saint Kitts and Nevis became independent on September 19, 1983.

5.4.10.2 Known Prehistoric Archaeological Sites in Nevis

Samuel M. Wilson conducted an archaeological survey of the island of Nevis from 1984 to 1986 (Wilson 2006). The survey focused on coastal areas, and did not include the island's interior. The survey identified a total of 21 sites. Wilson divided these sites into three periods based on their materials remains. There were two Period 1 sites, which are not associated with ceramics and were thought by Wilson to date to approximately 600 BC. There were two Period 2 sites, which are associated with Saladoid ceramics and were thought to date from approximately 300 BC to AD 600, and there are 17 Period 3 sites, which are associated with Ostionoid ceramics and are thought to date from AD 600 to 1620 (i.e., until colonization by Europeans). All of the sites identified by Wilson are in coastal locations.

5.4.10.3 Known Historical Sites and Landmarks in Nevis

There is only one site in Saint Kitts and Nevis on UNESCO's World Heritage List, which is the Brimstone Hill Fortress National Park on Saint Kitts (https://whc.unesco.org/en/list/910). There are two additional sites on the World Heritage Tentative List. The first is the Historic zone of Basseterre on Saint Kitts (https://whc.unesco.org/en/tentativelists/1116/), and the second is the City of Charlestown on Nevis (https://whc.unesco.org/en/tentativelists/1117/).

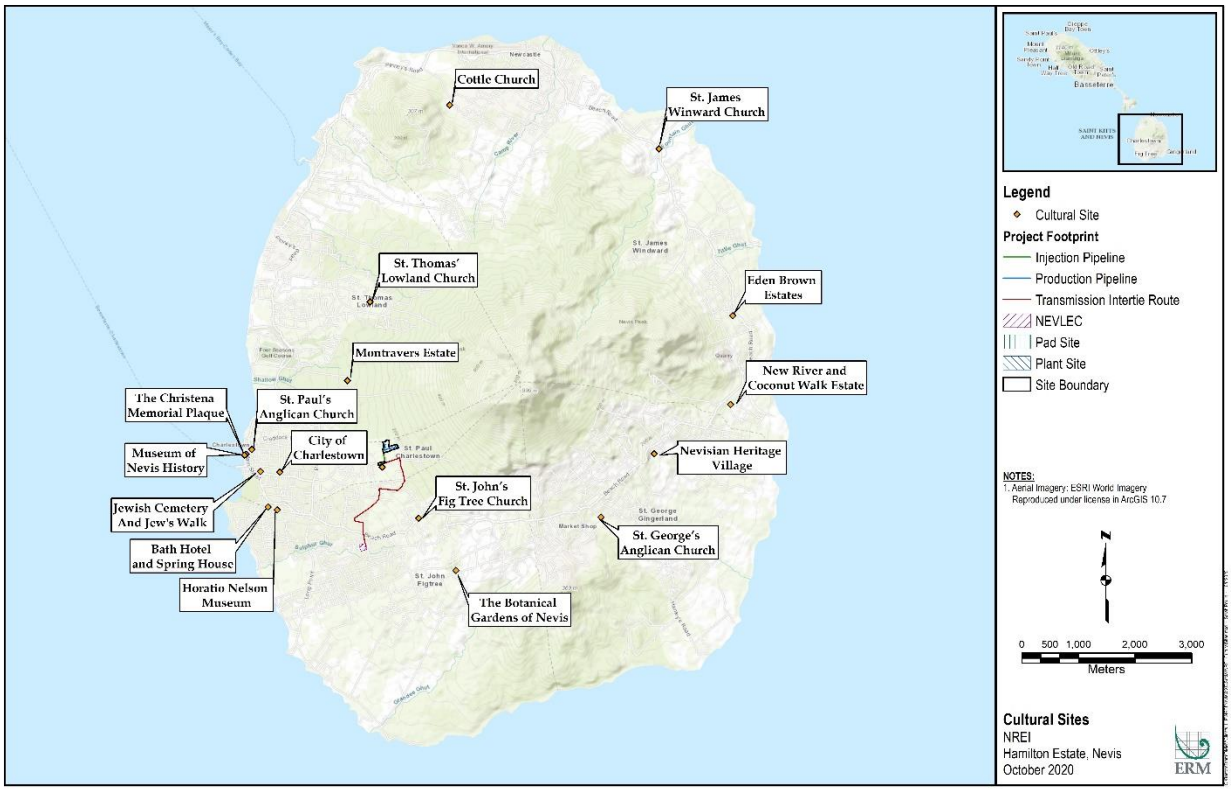
According to the Nevis Tourism Authority, there are currently 17 historical sites and landmarks on Nevis (Table 5-5). The location of these sites in relation to the Project Area are depicted in Figure 5.2-1. In addition, it was announced in January 2020 that Nevis is collaborating with the United Nations Development Program (UNDP) for a reclamation and protection project for Fort Charles, which is a historic site on the island of Nevis that has been severely eroded by rising sea levels.[109]

Table 5-28. Nevis Historical Sites and Landmarks

Site	Parish
Bath Hotel and Spring House	St. Thomas
Charlestown	St. Paul
Cottle Church	St. James
Eden Brown Estate	St. James
Horatio Nelson Museum	St. Thomas
Jewish Cemetery and Jew's Walk	St. Thomas
Montravers Estate	St. Thomas
Museum of Nevis History	St. Thomas
Nevisian Heritage Village	St. George
New River & Coconut Walk Estates	St. James
St. George's Anglican Church	St. George
St. James Winward Church	St. James
St. John's Fig Tree Church	St. John
St. Paul's Anglican Church	St. Paul
St. Thomas' Lowland Church	St. Thomas
The Botanical Gardens of Nevis	St. John
The Christena Memorial Plaque	St. Thomas

Source: Nevis Tourism Authority (https://nevisisland.com/nevis-history/historical-sites-landmarks).

[109] Loop Cayman, Nevis Partners with UNDP for Fort Charles Protection Project (2020) accessed at http://www.loopcayman.com/content/nevis-partners-undp-port-charles-protection-project-0



Source: ERM, 2020.

Figure 5-59. Location of Nevis Historical Sites and Landmarks

5.4.10.4 Living Heritage in Nevis

In addition to the sites described above, local traditions are celebrated such as "Culturama," a weeklong celebration held on Nevis during Emancipation Day weekend to celebrate the history of the country (The Culture of St. Kitts and Nevis, The Journal of Race & Policy, 2013). Nevis also holds a "Tourism Week" in mid-February (Nevis Statistical Digest, 2018). The islands also celebrate Carnival, which commences just before Christmas and continues until January 2, a tradition that dates back to times of slavery when slaves were allowed to celebrate the week between Christmas and New Year (The Culture of St. Kitts and Nevis, The Journal of Race & Policy, 2013).

5.4.10.5 Cultural Heritage Stakeholders

A key NGO remains actively involved in projects related to heritage conservation, environmental management, and protection on Nevis, the Nevis Historical and Conservation Society (Casey D. Allen, Landscapes and Landforms of the Lesser Antilles, 2017). The society was established in 1980 to "conserve the natural, cultural and historic fabric of the island of Nevis and her surrounding sea for all its people" (www.facebook.com/NevisHeritage/). The society is based at the Museum of Nevis History, which is also the known as the birthplace of American statesman Alexander Hamilton. Alexander Hamilton was born in Nevis, but immigrated to the American colonies in his youth, was a senior aide to General George Washington in the American Revolutionary War, and became the United States of America's first Secretary of the Treasury.

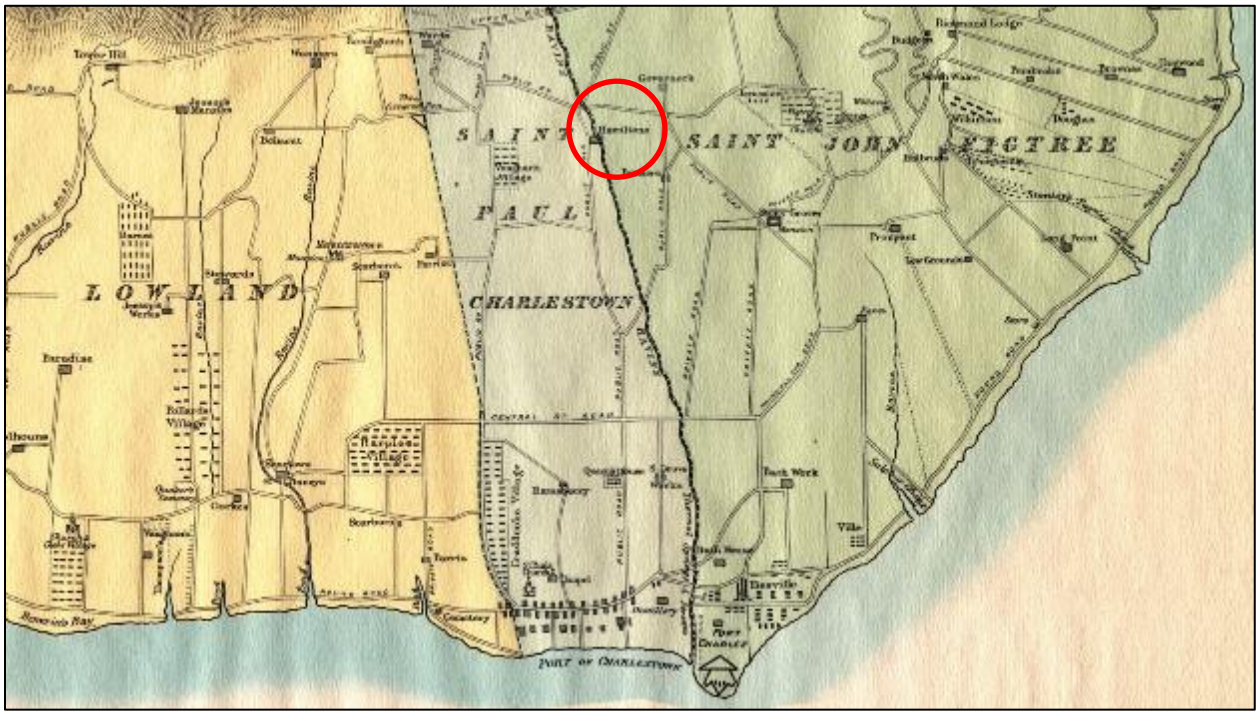
5.4.10.6 Known Cultural Heritage in the Project Area

There are no known prehistoric archaeological sites (Wilson 2006) and no currently listed historic sites or landmarks in the Project Area (https://nevisisland.com/nevis-history/historical-sites-landmarks). There is a known, non-listed historic site adjacent to the Project Area, however, which is the sugar works ruins at the Hamilton Estate Plantation.

The Hamilton Estate Plantation is named after Andrew Hamilton, who purchased the land in 1772. Although there is no established connection between Andrew Hamilton and Alexander Hamilton (Point Impact Analysis 2017:59-60), the estate is generally believed to have been owned by the latter's family (e.g., https://www.smithsonianmag.com/travel/alexander-hamilton-nevis-caribbean-island-180964047/). The estate was 552 acres when purchased by Andrew Hamilton, but he later added land to it, bringing its total to 580 acres. The lands were worked as a sugar plantation from Andrew Hamilton's time into the 20th century. In 1900, there were still 10 steam mills and 6 windmill in operation on the estate, but by 1921 there were only 3,000 acres of land under sugar cultivation. The colonial government purchased the estate in 1933, and sugar production ceased in 1951 (Point Impact Analysis 2017:59-60). The location of the Hamilton Estate Plantation is depicted on a historic 1871 map of Nevis by Edward Stanford (Figure 5.2-2).

The Hamilton Estate is mentioned as a tourist destination on several tourism websites, and there is a Nevis Heritage Trail sign at the sugar work ruins advertising it as "one of the most complete plantation factories in the Caribbean" and "one of the last remaining inland sugar factories in Nevis" (e.g., https://angieaway.com/2019/03/19/nevis-travel-guide/).

The sugar work ruins at the Hamilton Estate are located south of Estate Road on Hamilton Heritage Trust land, opposite the proposed site of the injection well. The historic ruins are located approximately 25 meters from the nearest portion of the proposed injection well site (Figure 5.2-3).



Source: "Map of the Island of Nevis," by Edward Stanford, 1871. Stanford's Geography, London. The location of the Hamilton Estate Plantation is circled in red.

Figure 5-60. Location of Nevis Historical Sites and Landmarks

Source: ERM, 2020. The sugar work ruins are circled in red.

Figure 5-61. Location of the sugar works ruins in relation to the injection well site

6. STAKEHOLDER CONSULTATION AND DISCLOSURE

Stakeholder engagement is an essential part of the ESIA and project development process. It ensures that stakeholders, including Project-affected communities, are provided with timely and transparent information regarding the Project, and allows stakeholders to provide input on potential issues of concern relating to the Project.

The stakeholder consultation and disclosure of information process conforms to international good practice and has been developed to align with the IFC's Guidelines for meaningful stakeholder consultation, and to enable a positive community change through community participation.

The objectives of stakeholder engagement are to:

- Promote the development of respectful and open relationships between stakeholders and the Project;
- Identify stakeholders and understand their interests, concerns and influence in relation to ongoing activities;
- Provide stakeholders, both interested and affected stakeholders, with timely information about the Project's activities, in ways that are appropriate to their interests and needs;
- Guarantee the active participation and consultation of the stakeholders throughout the life of the Project. During the consultations there should not be any form of manipulation, interference, coercion or external intimidation;
- Support alignment with the international requirements, corporate standards and guidelines for stakeholder engagement;
- Record feedback and resolve any grievances that may arise through a formal feedback mechanism;
- Identify the resources and responsibilities for the stakeholder engagement execution, including the monitoring activities; and
- Monitor and evaluate the actions carried out to adapt or modify the Project's Stakeholder Engagement Plan (SEP) as necessary.

6.1 Consultation Process and Principles

Effective participation requires sharing information related to projects with Affected Communities, facilitating a well-informed consultation process and the contribution of interested citizens to the design and planning of the Project. Therefore, the Project will carry out a process of public consultation and disclosure of information through the following activities:

- **Information exchange**: Communication of relevant and important information about the Project to the Affected Communities;
- **Stakeholder Consultation**: Consultation with informed stakeholders to discuss Project components and activities including potential challenges and opportunities associated with those affected, in a two-way process that allows for the incorporation of feedback from the parties. interested in the design and planning of the Project; and
- **Disclosure**: Verification of the plans, activities and conclusions of the Project with the parties involved so that the feedback has been understood and is effectively incorporated, and to maintain transparency in the participation process.
- Additionally, NREI will include the following considerations and principles for each participation activity:

- **Scheduling**: All forms of participation will be carried out in a timely manner. The invitations to the meetings will be in advance of the participation activities (it will be ensured that the invitations are issued through letters or letters at least two weeks before the event), to ensure that those interested have the opportunity to participate without interruption in their personal schedules. The scheduling of participation meetings will be planned taking into account the restrictions of interested parties and local holidays, among others. This programming will be carried out in consultation with the interested parties to ensure its adequacy;
- **Place**: When applicable, all participation activities will be carried out in easily accessible places, and where attendees can arrive without major difficulty, cost or travel time. Such venues should also be free of political or other associations, so that stakeholders feel free to openly participate in discussions;
- **Transportation**: When necessary, and according to circumstances and conditions, the Project will provide transportation for participation activities;
- **Cultural Adequacy**: All forms of stakeholder participation and activities will be designed to meet the needs of the beneficiaries, in order to ensure that everyone has the opportunity to participate freely and in an informed manner;
- **Transparent**: The consultation process should be transparent and based on factual information, including about the scope of consultation and ability of stakeholders to influence Project decisions;
- **Inclusive**: The consultation will be equitable and non-discriminatory and will ensure that poorer or more vulnerable parts of the affected stakeholders are given a voice.
- **Gender-equitable**: The consultation process shall reflect women's and men's concerns equally, as women may have different perceptions than men when it comes to how benefits or risks should be assessed, or how different aspects are valued. If joint public consultation meetings are unlikely to capture men's and women's views equally, consideration should be given to holding separate focus group discussions or other methods to engage with women;
- **Free of coercion**: consultation events and other forums or means of engaging with stakeholders should be respectful and free of coercion. Stakeholders who express concerns or criticism against the Project or authorities should be protected from retaliation;
- **Language**: In all cases, activities will be conducted in English using simple terminology (non-technical and concise) and effective communication tools (including verbal, image-based or other alternatives, in written format). This ensures that all participants have the opportunity to understand Project information and actively participate in discussions; and
- **Recording and Feedback**: all group participation activities will be recorded on video, with the due consent of the participants. This will ensure the transparency of the consultation processes and allow verifying the strength of the process. Relevant aspects of the consultation process should be disclosed publicly.

The Project must establish a planning framework for the participation of the groups and interested persons, including their identification, the methods of participation, the information to be shared, responsibilities and the phase of the Project in which these activities should be carried out. This framework must be carried out at the beginning of the Project and must continue to be implemented throughout its life. For this purpose, the Project has a Stakeholder Engagement Plan (see the Environmental and Social Management Plan, ESMP Report).

6.1.1 Consultation Phases

According to the IDB policies, at least two consultations must be organized for all Category A projects. A first formal public consultation was held in Charlestown on June 17, 2017; approximately 200 people attended the meeting (see Section 6.2). The Project plans to carry out a second consultation for the exploitation phase, categorized as Category A.

It is important to note that the Project does not require resettlement, therefore the IDB Policy on Involuntary Resettlement (OP-710) that states that consultations should be held with a cross-section of displaced communities and host communities in the stages of formulation, execution and monitoring of the resettlement plan, is not applicable. Similarly, the IDB's Operational Policy on Indigenous Peoples (OP-765) is not applicable, as indigenous peoples will not be affected by the Project. Nonetheless, the Project is committed to carry out a meaningful consultation, culturally adequate, transparent and inclusive.

The Figure below presents the different consultation steps to be carried out by the Project for the second consultation event that is expected to take place in October 2020. These phases are explained in more detail in the following sections.

Source: ERM, 2020

Figure 6-1: Consultation Process

6.1.1.1 Invitations

The invitations to the public consultation will be done by phone, email or letter. The public consultation will also be advertised in the local newspaper. The invitations will be issued at least two weeks in advance and

indicating the date, place and time. The newspaper advertisement with the public consultation details will be published a week before the event takes place.

Along with the invitation, NREI will add a brief explanation of the purpose of the consultation, the mechanics of the process and the rights of those attending. The letter will specify the topics that will be presented and request the needed input from the affected communities. Likewise, a document in a PowerPoint format indicating the planned Project and environmental information will be made available to the participants.

Due to the current COVID-19 global pandemic the consultation will not be in person and therefore will not take place in a physical location. Nonetheless, the consultation event is planned to be carried out online. During the online consultation event the participants will be able to ask questions, express comments and/ or concerns. The consultation will be recorded and will be made available in an online website or platform. NREI will send the link with the recorded consultation to all the attendees and list of identified stakeholders. The Project will accept further comments and questions from the stakeholders for a week after the consultation recording is distributed.

6.1.1.2 Consultation Topics

Disclosing information in a truthful, timely and understandable manner for attendees is one of the principal objectives of a meaningful consultation. To this purpose, there must be sufficient time (at least two hours) for the presentation and the participation of all the participants in the event.

In the Public Consultation, the following topics will be explained and discussed:

- Design of the Project and how it is inserted in a national effort to develop and improve energy generation;
- Environmental and social impacts of the Project identified in the ESIA processes;
- Specific studies to be carried out; and
- Schedule of expected times for the Project's different phases.

6.1.1.3 Documentation

NREI will present a report to the interested parties and affected stakeholders on the results of the public consultations and will justify the decisions and actions taken. In addition, oral reports will be delivered informally to the community during public information events and conversations to be carried out by the Project's staff.

The interaction with the interested parties and affected stakeholders in the Project's Area of Influence will be systematically documented in a formal record, including a database and a physical file in which all written communications with the affected communities will be registered. The file will also include a photographic evidence of all group meetings, attendance lists and meeting minutes.

6.2 Past Consultations and Outreach Activities

Stakeholder engagement and outreach activities have been carried out by the Project since 2017. Since this date, the Project has carried out some consultation activities to provide the public with information about the Project and its potential impacts, to elicit public input and feedback on various Project aspects and access local knowledge on baseline environmental, social and health conditions in the Project area communities. These activities included:

- The 2017 EIA was posted for public comment in the Nevis Public Library in Charlestown on May 15, 2017. No written comments were received from interested parties.

- A one-hour call-in session was held on the Nevis Radio station, on Wednesday, June 14, 2017, hosted by the Honorable Mark Brantley, the Deputy Premier.

In addition, a formal public consultation, advertised in the local newspaper, was held in Charlestown on June 17, 2017. The consultation was part of the impact assessment process required by the Department of Physical Planning and Environment (DPPE) on St. Kitts and the Department of Physical Planning Natural Resources and the Environment (DPPNRE) on Nevis, supported by the Development Control and Planning Act and the Nevis Development Control and Planning Ordinance respectively, who have developed guidelines for the conduct of Environmental Impact Assessments. Approximately 200 people attended the meeting. NREI has a recorded video of the presentation where the CEO and President of Thermal Energy Partners explained the Project's history and Environmental Impact Assessment (EIA) process; they highlighted that the EIA was posted for public comments and detailed the Project's elements and activities. During the presentation, a video about how geothermal energy works was played. Details about the plant were also given, together with the impact assessment criteria, methodology and topics (e.g. biology, land use, noise, etc.). A number of impacts were presented in more detail, such as climate and air quality both during construction and operation. Noise impacts and noise levels, water resources impacts and aesthetics impacts.

Questions focused on when the project would start, how long would construction take and if the geothermal plant would reduce the cost of electricity. A local reporter was concerned about the use of a flammable working fluid, cyclopentane. The response discussed the double-walled tank and spill containment structure, air monitoring as well as the fire protection equipment and procedures on site. The reporter was satisfied and indicated that he had no further questions. A solar representative recommended solar panels as an alternative to the Project. The answer provided highlighted that solar panels could not operate at night and would not displace all the diesel-fired generation that the proposed Project would displace. The following table summarizes the comments received during the consultation.

Table 6-1: Summary of Questions and Comments (2017)

No.	Question or Comment	Answer
1	When will the Project start?	Plant construction will begin by clearing and grading brush and scrub vegetation in the areas to be developed for the plant, and leaving a vegetated buffer around the production well pad and north of the plant. It is expected to start approximately in 2020.
2	How long would construction take?	The plant will approximately take 18-19 months to be built.
3	Will the geothermal plant reduce the cost of electricity?	The proposed geothermal Project would provide baseload renewable electricity to the island of Nevis and reduce the reliance on diesel fuel for power generation.
4	A concern was expressed about the use of a flammable working fluid, cyclopentane.	The response focused on the double-walled tank and spill containment structure, air monitoring as well as the fire protection equipment and procedures on site. The reporter was satisfied and indicated that he had no further questions.
5	A participant recommended solar panels as an alternative to the Project.	The answer provided highlighted that solar panels could not operate at night and would not displace all the diesel-fired generation that the proposed Project would displace.

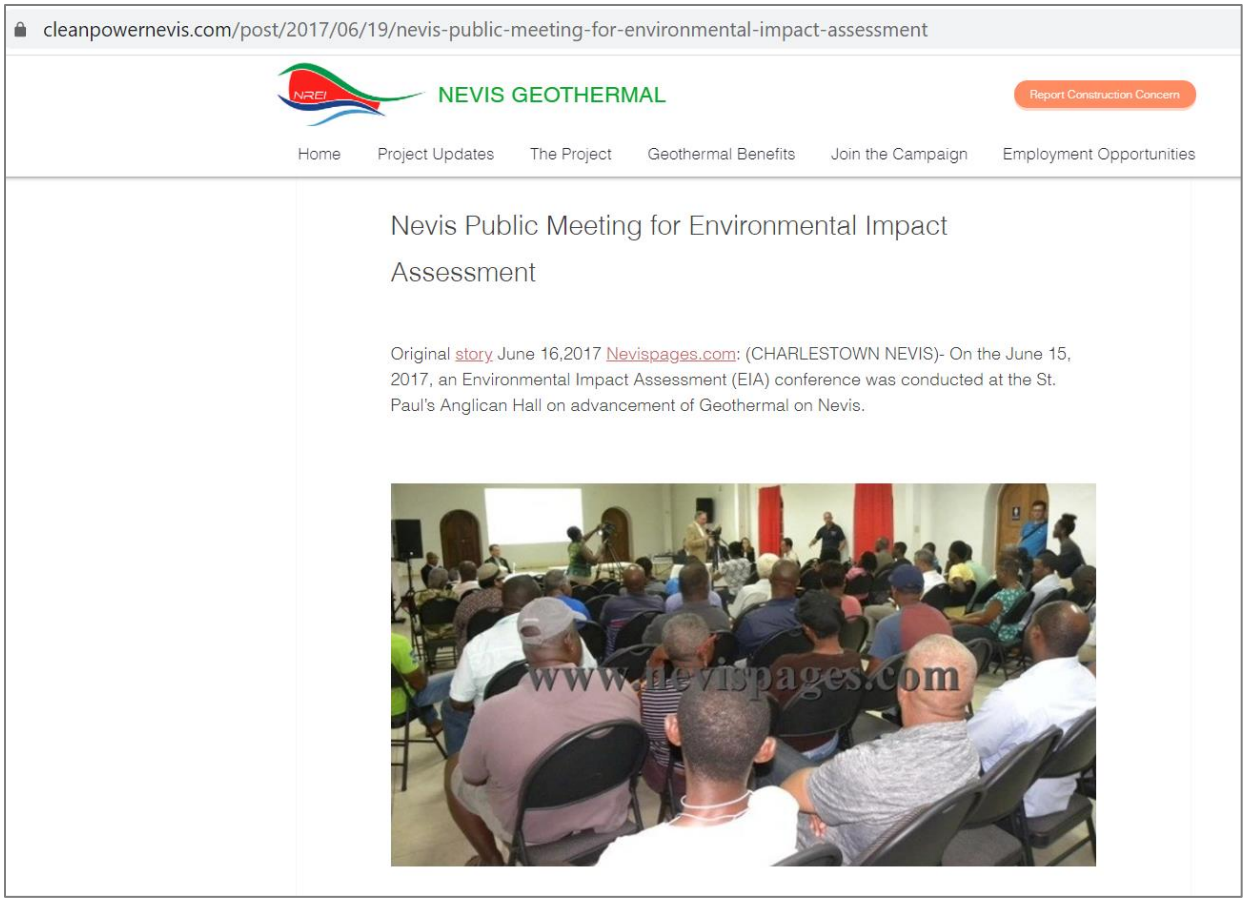
Source: NREI, 2020

The Figure below shows photographs from the public consultation.

Source: nevispages.com

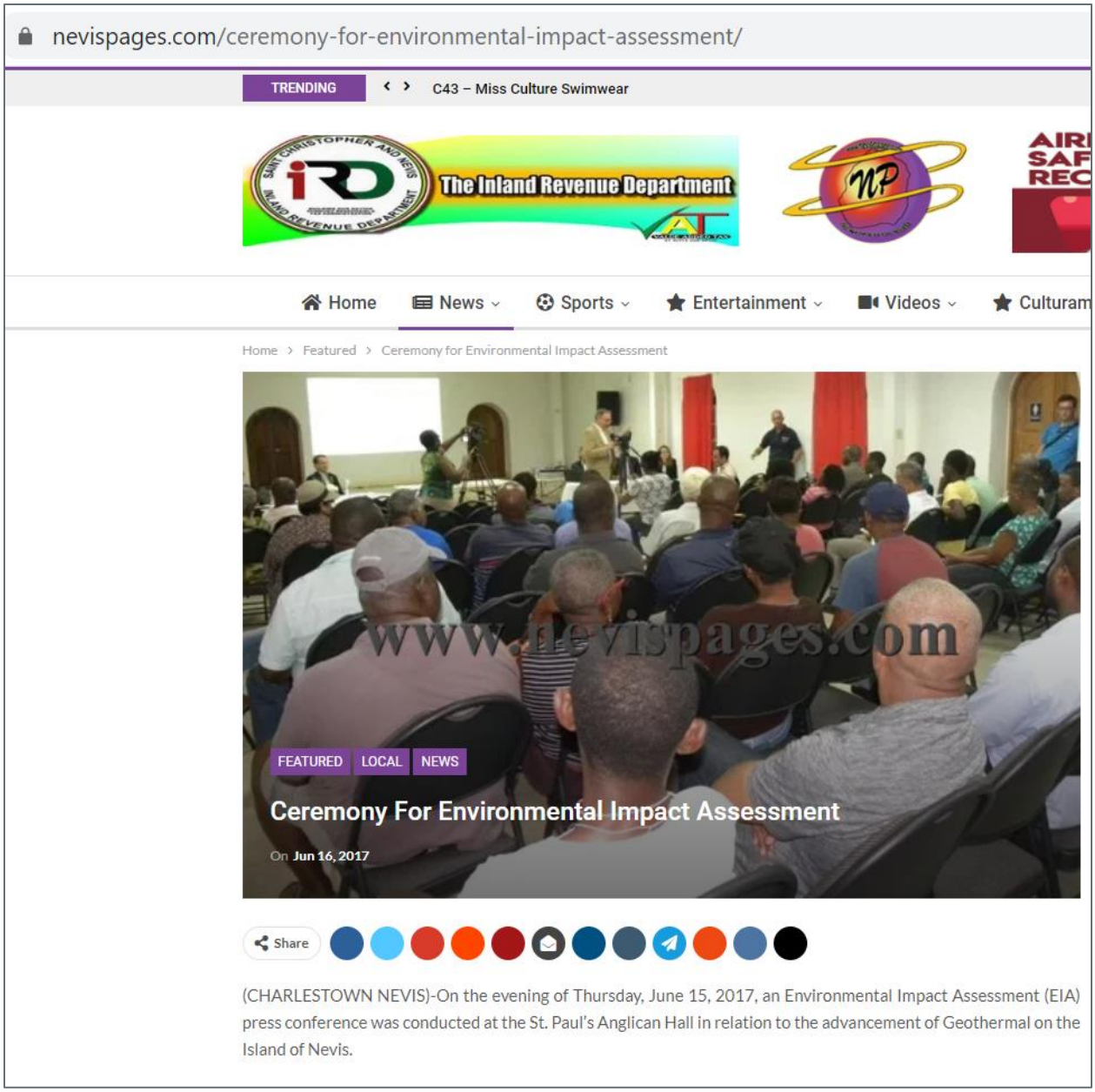
Figure 6-1 Photographs from Public Consultation Event

Details of the public consultation were also published on the news site nevispages.com and on the Project's website, as can be seen in the Figures below.



Source: nevispages.com

Figure 6-2 Public Consultation Information on NREI's Website



Source: nevispages.com

Figure 6-3 Article on Public Consultation on Nevis Pages

Lastly, stakeholder engagement was conducted with 16 landowners near the Project site in February 2017, and follow-up interviews were conducted in May 2018 (for more details, see Table below). For one landowner who is particularly close to the site, the first engagement took place in June 2016 and then periodically every three months until December 2019. The Project also engaged with the nearby business Bananas Bistro, whose owner was concerned about visual impacts. The Table below summarizes interviews held with landowners adjacent to the project site.

Table 6-2: Interviews with Landowners (2017-2019)

Date contacted	Nearby Property Owners	Comments	Follow up actions
Contacted by M. Tross, Feb 2017 follow-up May 2018, several other contacts	#1	No residences on site. Land use is limited to approximately 30 acres in northeast direction from site cleared for limited grazing and gardening. Total land ownership exceeds 300 acres. No problem with project.	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#2	Cleared grazing land, no residences, one outbuilding on site. Land is for sale. Conducted noise monitoring during Feb, 2018. No objections to project.	Follow-up if land acquisition is desirable.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#3	Uncleared vacant land. Owner is interested in selling property to project. No objections to project.	Follow-up if land acquisition is desirable.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#4	West of site, separated from site by other property. Uncleared vacant land.	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#5	West of site, separated from site by other property. Uncleared vacant land.	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#6	West of property. Separated from site by unknown property to east. Land is undeveloped, vacant.	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018	NHLDC Property	Southwest of site, undeveloped land owned by NIA	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#7	Southwest of site, separated from site by Hamilton Heritage land and NHLDC land. One residence on site. No objection to project.	Contact again prior to developing HHT parcel to south where injection wells will be installed.
[Not available]	Hamilton Heritage Trust	6 small parcels of land held by NIA. No active residences. One unit in southwest has been dedicated to the geothermal project for installation of the injection wells. This 1.1-acre parcel contains abandoned and dilapidated building that was a former stable. Building will be demolished during the construction of plant.	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#8	South of plant site separated from plant site by HHT land and other parcel. Uncleared vacant land. No structures or roads on property.	None.

Date contacted	Nearby Property Owners	Comments	Follow up actions
Contacted by M. Tross, Feb 2017 follow-up May 2018	Carino Hamilton Company LTD	3 story condo/apartment property. Separated from plant site by 2 HHT parcels and privately-owned parcel. Landowner objected to Project. The skakaholders mentioned they are involved in the sale of solar panels.	Useful to keep landowner informed of progress and address concerns as they arise.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#9	Uncleared vacant land adjacent to southeast boundary of property.	None.
Contacted by B. Cutright, June 2016, and periodically every 3 months until December 2019.	Bananas Restaurant	Well known restaurant to southeast of plant site. Owner was concerned with visual impact of plant. No objections to plant as it is seen as a benefit to reducing the cost of electricity. Provided line-of-site study to owner to illustrate no or limited impact upon completion of construction. Conducted noise monitoring during installation of N-4 well. Then, once during normal evening activities at restaurant. Noise exceeded 85 decibels on site.	Owner is involved in the community and very supportive. NREI to keep in contact and keep owner informed regularly on progress. May arrange tours for customers to maintain support.
Contacted by M. Tross, Feb 2017 follow-up May 2018.	#10	Uncleared vacant land. No objections to Project.	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018.	#11	Uncleared vacant land. No objections to Project.	None.
Contacted by M. Tross, Feb 2017 follow-up May 2018.	#12	Adjacent to west property boundary. Uncleared vacant land. No contact with owner.	None.

Date contacted	Nearby Property Owners	Comments	Follow up actions
Contacted by M. Tross, Feb 2017 follow-up May 2018.	#13	Adjacent to west property boundary. Uncleared vacant land.	Useful to contact in future for general communications.
Contacted by B. Cutright, June 2016, and periodically every 3 months until December 2019.	#14	Property is adjacent to and northeast of plant site. Met with owner several times before, during and after installation of N-4 Test well. Have no objections to project but were concerned about losing vegetation along the boundaries of their property, and thus the privacy of their back yard. NREI monitored noise levels on each visit.	NREI to contact regularly to keep informed of progress. Plant layout and design maintains 50-foot vegetation buffer along north and east plant grounds to ensure visual and acoustic buffer between plant and property.

Source: NREI, 2020

The following Figure presents a map with the different identified parcels near the Project.

Source : ERM, 2020

Figure 6-1: Project Footprint and Parcels near the Project

6.3 Stakeholder Groups Identification

The identification of the stakeholders is essential, since it provides the basis for designing the relationship strategies with each interest and affected group in order to achieve the greatest possible participation and social acceptance. To the extent that as the participation and acceptance grows, social impacts and risks may be minimized in greater proportion. Likewise, the mapping helps to define which interest groups the Project should contact and how to manage the risks.

One of the main measures to minimize social impacts and at the same time contribute to the formation of a basis for the implementation of mitigation or remediation measures, will be the establishment of fluid communication and relationships with local, regional, national and international interest groups from the initial phase of the Project.

This section contains a summary on stakeholders, that is, those stakeholders that may be affected, and those that may have any influence and / or interest in the presence of the geothermal activity that will be carried out within the framework of this Project. To that end, there has been an identification and mapping of stakeholders and, on the other hand, the evaluation of their perception. For more details, see the Stakeholder Engagement Plan.

For the identification of stakeholders, the following criteria were considered: a categorization by institutional level, the organization to which they belong and / or their function (such as, for example, national government, local government, civil society, national and international research organizations, other operators etc.).

Information for all identified stakeholders (name of organization, contact information, relevance to the Project) will be compiled in an Excel-based record, for more details see the Stakeholder Engagement Plan. The register will be updated continuously throughout the different stages of the Project as new stakeholders are identified or understanding of different stakeholders is developed.

Stakeholders were initially identified by searching the Internet, by reviewing documentation during the development of the baseline of the environmental impact study, and through prior knowledge of the Project's area of influence.

The following criteria were used to analyze the perception of the interested parties:

1) Their interest in geothermal activity (High; Medium; Low); and

2) Their influence with respect to geothermal activity and / or exploration (High; Medium; Low).

Secondary sources of information were used for the aforementioned aspects, which provided indications for making an inference of the possible perception of each interested party about the Project. The methods used included:

- Search, review and evaluation of information available in publications, newspapers and magazines with local and national editions and information available on official websites of institutions and organizations, about mentions of geothermal activities in Nevis. The objective is to know what the concern is for the environmental situation of the sea and offshore hydrocarbon activity, including those of superficial exploration that are the ones implied by this Project;
- Consideration of prior conflicts and / or denunciations of socio-environmental aspects in the area in which the Project will be carried out. These may be associated with geothermal activity, as well as conflicts related to urban problems or settled industries in this sector. The purpose is to identify the degree of existing sensitivity and to know which actors intervened and what their position was in this regard;

In addition, interviews with stakeholder were used to confirm their positioning and interest. The identification carried out and the evaluation of perception are found in the Section 6.4. With this information, a map of interest and influence was also made to visualize which of these actors should be monitored, kept satisfied, kept informed or managed closely (see Section 6.4).

6.3.1 Stakeholder Groups

Stakeholder groups are individuals, groups or institutions that have a stake or a particular interest in the Project. They may be affected by it (either positively or negatively) or they may have an interest in it and be in a position to influence its outcomes. Therefore, the stakeholder groups have been classified as:

1) *Interested groups*, which can be Project beneficiaries and commonly favor the Project; and
2) *Affected groups*, which are individuals or groups adversely affected by the Project and consequently some might oppose the Project.

The following *interested stakeholder groups* have been identified in the Project's AOI:

- Government entities relevant to the Project
- Neighboring Projects
- Financial Institutions
- Mass Media
- Contractors
- Potential workers and staff

The following *affected stakeholder groups* have been identified in the Project's AOI:

- Communities in the Area of Influence and landowners near the Project site
- Tourism sector
- Vulnerable groups in the AOI
- NGOs, associations and civil organizations

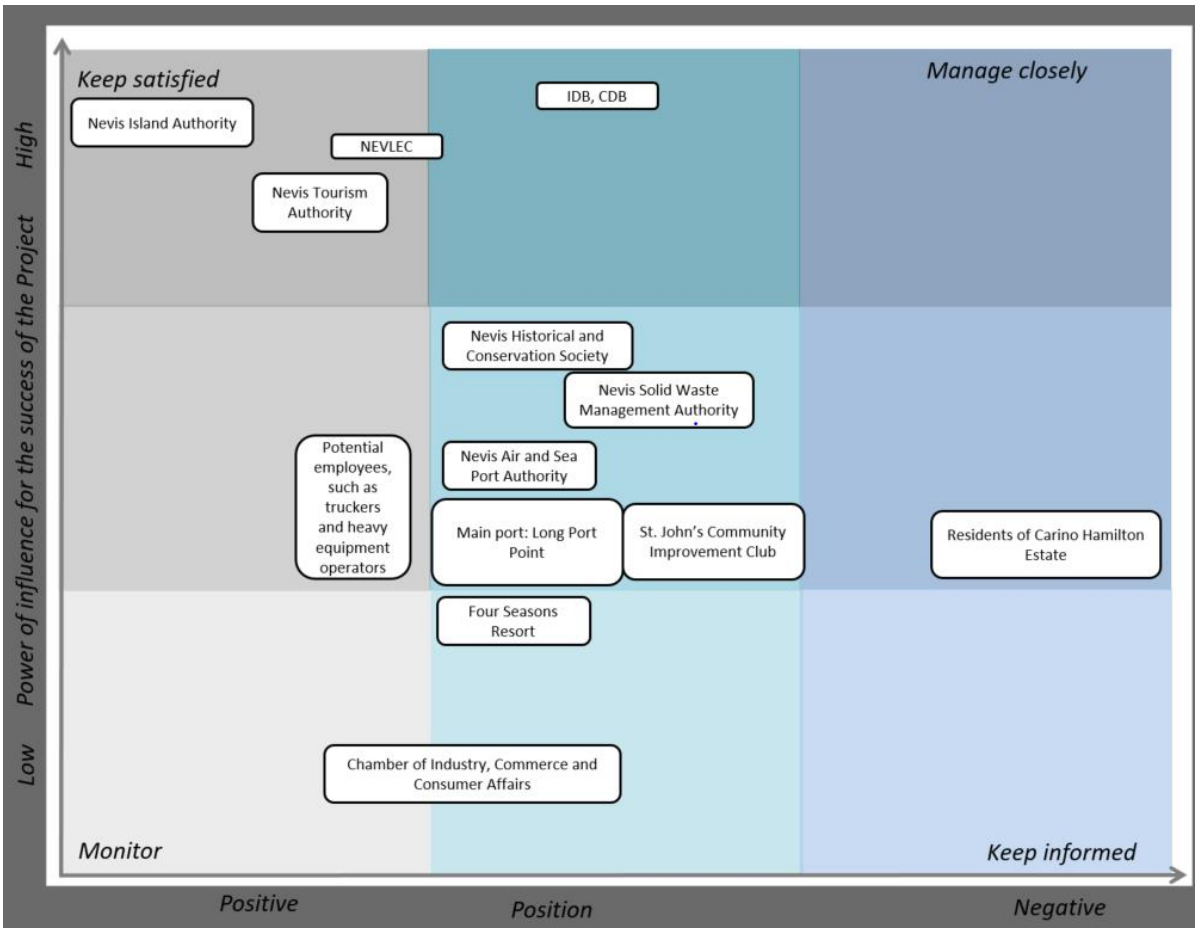
6.4 Stakeholder Mapping and Analysis

In the table below, the interest groups' position, interest and influence have been identified and analyzed. 10 categories of interest groups have been identified:

1) Communities and landowners in the Area of Influence
2) Neighboring Projects
3) Vulnerable Groups
4) Tourism sector
5) Government Entities
6) NGOs and Civil Associations
7) Financial Institutions
8) Contractors
9) Potential Workers
10) Mass media

The following figure shows the identified actors of the 10 categories of interest groups and their probable position and influence on the Project according to the qualitative analysis. The categories of interest groups

were assigned in an X-Y axis according to their probable interest (X axis) and the influence (Y axis) with respect to the Project.



Source: ERM, 2020

Figure 6-4 Stakeholder Mapping

A qualitative mapping criteria scale was applied in order to position the stakeholders on the X-Y axis. The level of influence of each interest group was determined as High, Medium or Low. Just as the probable interest was determined as High. Medium or Low.

Further, the table below shoes the stakeholder identification that was carried out and the evaluation of their perception.

Table 6-3: Stakeholders in relation to the Project based on their interest and influence

Stakeholder Group	Description	Identified Actors	Potential Position (Against, Neutral, In favor)	Interest (Low, Average, High)	Influence (Low, Average, High)
Communities in the Area of Influence and landowners near the Project Site	It refers to those locations that are within the perimeter of the Project or neighboring areas and may be affected by the Project.	■ Carino Hamilton Estate	Against	High	Average
Local Authorities and Government entities relevant to the Project	It refers to Nevis island authorities that might be affected by the Project.	■ NIA, NASPA, Nevis Solid Waste Management Authority	In favor	High	High
Tourism Sector	Businesses in the tourism sector, such as restaurants, hotels, or the tourism department.	■ Bananas Bistro, Four Seasons Resort, Nevis Tourism Authority	Neutral	Average	High
Neighboring Projects	Refers to any projects that are being developed by the Project site	■ Water Department tanks projects	Neutral	Low	Average
Vulnerable Groups in the AOI	This category includes identified vulnerable groups in the AOI	■ Women, children and elderly ■ Indigenous People ■ Families and individuals in extreme poverty ■ People with physical and psychological disabilities ■ Individuals that depend on natural resources such as	Neutral	Low	Low
NGOs and Associations	Local and regional ONGs and associations that could generate opinions about the development of the Project or that could participate in conflict resolution that could take place within the communities.	■ St. John Community Improvement Club ■ Nevis Historical and Conservation Society	Neutral	Average	Average
Contractors	It includes NREI's contractors and sub-contractors.	■ The Project's clients, suppliers, contractors and subcontractors. They will be defined once the Project begins.	Neutral	Average	Average
Workers and Staff	It includes all of NREI's workers and staff.	■ The Project's workers.	In favour	High	Low

Stakeholder Group	Description	Identified Actors	Potential Position (Against, Neutral, In favor)	Interest (Low, Average, High)	Influence (Low, Average, High)
Financial Institutions	Includes financial institutions interested in financing the Project	■ InterAmerican Development Bank ■ Caribbean Development Bank	Neutral	High	High
Mass Media	Includes mass media in the Project area.	■ SKN News ■ Voice of Nevis Radio	Neutral	Average	High

7. IMPACT ASSESSMENT

7.1 General Methodology

The primary purpose of an Environmental and Social Impact Assessment (ESIA) is to predict the impacts resulting from the proposed project. Impacts can be direct, indirect, or induced, as defined in the table below.

Table 7-1: Impact Designation Definitions

Designation	Definitions
Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between disturbance of a plot of land and the habitats on that plot of land that are affected).
Indirect	Impacts that follow from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the presence of a large Project workforce).
Cumulative	Impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity added to other existing, planned, and/or reasonably anticipated actions, projects, or activities. For practical reasons, the identification, assessment, and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concern and/or concerns of Project-Affected Communities

Source: ERM, 2020

The assessment of impacts proceeds through an iterative process that considers four questions as illustrated in the figure below.

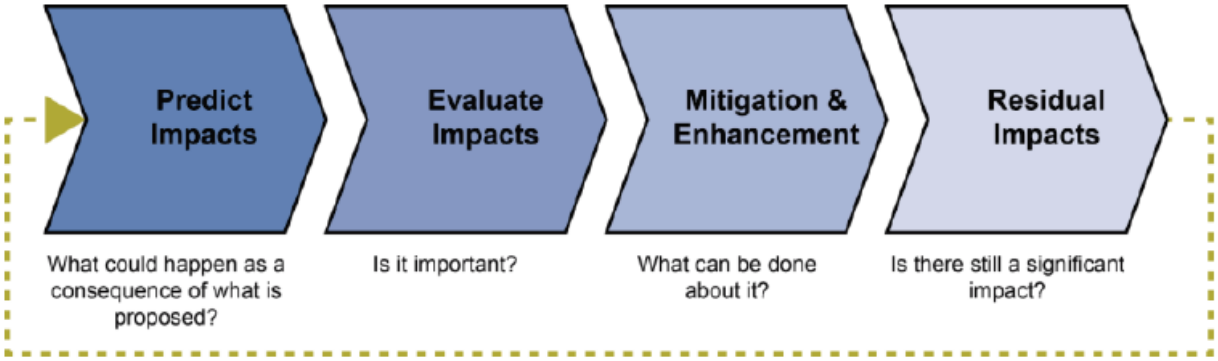


Figure 7-1: Impact Prediction and Evaluation Process

These questions are expanded in Steps 1 through 4 below.

Step 1: Predict Impacts

An ESIA evaluates potential project impacts by predicting and quantifying to the extent possible the magnitude of impacts on resources (e.g., water and air) or receptors (e.g., people, communities, wildlife species, habitats). Magnitude is a function of the following impact characteristics:

- Type of impact (i.e., direct, indirect, induced);
- Nature of the change (what is affected and how);
- Size, scale, or intensity;
- Geographical extent and distribution (e.g., local, regional, international); and
- Duration and/or frequency (e.g., temporary, short term, long term, permanent).

Magnitude describes the actual change that is predicted to occur in the resource or receptor. The magnitude of an impact takes into account all the various dimensions of a particular impact in order to make a determination as to where the impact falls on the spectrum (in the case of adverse impacts) from *Negligible* to *Large*. Some impacts can result in changes to the environment that may be immeasurable, undetectable, or within the range of normal natural variation. Such changes can be regarded as essentially having no impact, and are thus characterized as having a *Negligible* magnitude. In determining the magnitude of impacts on resources and receptors, embedded controls (i.e., physical or procedural controls that are planned as part of the project design) are taken into consideration (e.g., the magnitude of impacts on stream water quality from construction take into consideration the effectiveness of proposed sediment and erosion control measures).

In addition to characterizing the magnitude of impact, the sensitivity/vulnerability/importance of the impacted resource/receptor is characterized. There is a range of factors taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor. Where the resource is physical (e.g., a waterbody), its sensitivity (to change) and importance (on a local, national, and international scale) are considered. Where the resource/receptor is biological or cultural (e.g., the marine environment or a coral reef), its importance (e.g., its local, regional, national, or international importance) and its sensitivity to the specific type of impact are considered. Where the receptor is human, the vulnerability of the individual, community, or wider societal group is considered. Other factors may also be considered when characterizing sensitivity/vulnerability/importance, such as legal protection, government policy, stakeholder views, and economic value.

As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent (i.e., *Low*, *Medium*, and *High*), but the definitions for these designations will vary on a resource/receptor basis.

Step 2: Evaluate Impacts

An ESIA evaluates the significance of a potential project impact by considering, in combination, the magnitude of the impact and the sensitivity/vulnerability/importance of the impacted resource or receptor. The assignment of a significance rating facilitates decision-makers and stakeholders to understand how much weight will be given to the issue in their process. In the case of positive impacts, the significance is assigned as *Positive*.

Significance was assigned for each impact using the matrix shown in the table below. This matrix applies universally to all resources/receptors.

Table 7-2: Evaluation of Significance of Impacts

Impact Significance Matrix		Sensitivity / Vulnerability / Importance of Resource/Receptor		
		Low	**Medium**	**High**
Negative Impacts				
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate

	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major
Positive Impacts				
Magnitude of Impact	N/A	Positive	Positive	Positive

Source: ERM, 2020

In terms of what the various significance designations represent, the following considerations are provided:

- An impact of *Negligible* significance is one where a resource/receptor (including people) will not be affected by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background variations.
- An impact of *Minor* significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently *Small* (with or without mitigation) and/or the resource/receptor is of *Low* sensitivity/vulnerability/importance. In either case, the magnitude will be well within applicable standards.
- An impact of *Moderate* significance has an impact magnitude that is within applicable standards but falls somewhere in the range from a threshold below which the impact is *Minor*, up to a level that might be just short of breaching a legal limit. To design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for *Moderate* impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable. This does not necessarily mean that impacts of Moderate significance have to be reduced to *Minor*, but rather that *Moderate* impacts are being managed effectively and efficiently.
- An impact of *Major* significance is one where an accepted limit or standard may be exceeded, or *Large* magnitude impacts occur to highly valued/sensitive resources/receptors.
- An impact of *Positive* significance is one that has been identified as having a positive effect on the receptor/resource. Generally, this ESIA does not attempt to characterize magnitude for positive impacts.

A goal of an impact assessment is to get to a position where a project does not have any *Major* residual impacts (i.e., after mitigation measures are considered), certainly not ones that will endure into the long term or extend over a large area. However, for some aspects, there may be *Major* residual impacts after all practicable mitigation options have been exhausted. An example might be the visual impact of a facility. It is then the function of the decision-makers and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on a project.

Step 3: Mitigation and Enhancement

An ESIA process aims to ensure that project decisions are made in full knowledge of their likely impacts on the environment and society. A vital step within the process for this ESIA was therefore the identification of measures that could be taken to mitigate potential impacts of the Nevis Geothermal Exploration Project (the Project).

The process involved identifying where potentially significant impacts could occur and identifying ways of mitigating those impacts as far as reasonably possible. A mitigation hierarchy was used in which preference is always given to trying to avoid or minimize the impact before considering other types of mitigation (i.e., remedy, compensate, offset). The conventional preferred hierarchy of measures, which was followed in this ESIA, is provided below:

- Avoid —remove the source of the impact;

- Minimize —reduce the magnitude of the impact;
- Mitigate—"repair" the results of the impact after it has occurred; and
- Compensate/offset—address the loss or change to a resource by replacing the loss/change in kind or with a different resource of equal value.

Step 4: Residual Impacts

Once mitigation measures are agreed to, the next step in the impact assessment process is to determine the residual impact significance. Residual impacts are the impacts that are predicted to remain after both embedded controls and committed mitigation has been taken into consideration. In most cases, the sensitivity/vulnerability/importance of a receptor is unaffected by proposed mitigation measures; the mitigation measure is typically intended to reduce the magnitude of a predicted impact, thereby reducing its overall significance.

It is important to note that not all impacts will be applicable for both the exploration and exploitation phases. The impacts applicable to each stage will be indicated as follows and summarized in Sections 7.7 and 7.8:

Exploration	Exploitation
	

7.2 Physical Resources Impact Assessment

This Chapter summarizes the major impacts to the physical resources of the Project Area. Additional information on the impact assessment conducted for the physical resources is also provided in the 2017 EIA and the 2020 Addendum to the EIA prepared for the Nevis Binary Geothermal Project.

7.2.1 Impact Discussion

7.2.1.1 Air Quality (Exploration and Exploitation) 

Introduction

This section presents an assessment of the Project impacts on air quality. Although air quality will be more important during exploration and the construction phase of exploitation, it is a consideration for both stages. The presence and concentration of potential air pollutants may vary depending on the characteristics of the geothermal resources. During well drilling and testing, impacts on air quality are primarily caused by hydrogen sulfide (H_2S) emissions. Other emission sources such as dust from construction areas (i.e., plant and transmission line construction) and roadways are expected to be insignificant. Carbon dioxide is also in the steam vented out during blow testing, although its emissions are considered *Negligible* compared to fossil fuel combustion sources (IFC EHS Guidelines for Geothermal Power Generation, 2007). The following sections discuss the assessment methodology, identification of air quality receptors, potential air

emissions from Project activities, determination of impact significance, description of mitigation measures, and determination of residual impact significance.

Assessment Methodology

Impacts on air quality are typically evaluated by reference to numerical standards for air quality and dust deposition. The Project is not a major source of dust; therefore, dust deposition is not discussed further. Air quality has been assessed following a standard methodology shown in Figure 7-2.

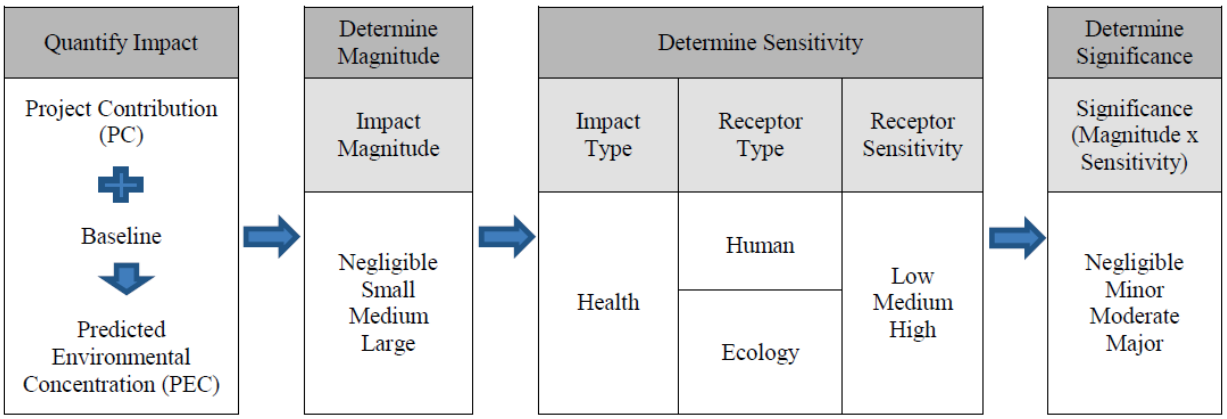


Figure 7-2: Air Quality Impact Assessment Process Flowchart

The approach combines impact magnitude with receptor sensitivity to determine impact significance.

The following subsections describe the magnitude and sensitivity approach used for evaluating impacts of airborne pollutant H_2S on human (health hazard and odor nuisance) and ecological receptors (plant growth).

Potential Air Emission Sources from Project Activities

Based on the previous sampling activities, some H_2S may be detected at the N-3 site and surrounding area during drilling. Hydrogen sulfide can accumulate in the top portions of mud pits when there is little wind or air movement, including up to lethal concentrations. Furthermore, some H_2S may be released during well testing. The analyses of the non-condensable geothermal gases collected during the March 2018 well testing done by GeoTherm found concentrations of H_2S.

Identification of Receptors

Based on a review of aerial photography, there are approximately 100 residential clusters and potential residential structures within approximately 1 km of the proposed Hamilton Heritage Trust and Hamilton Stables parcels where the proposed binary power plant, production wells, and injection well will be located. Impacts on ecological receptors (such as plants and animals) with the Project Site are discussed in Section 7.3 Biodiversity Impact Assessment.

Magnitude of Impact

The IFC method of determining the magnitude of air quality impacts is based on two factors:

- The increase in pollutant concentrations in air as a result of the project based on detailed air dispersion modeling (Project Contribution [PC] or incremental impact); and

- The total air pollutant concentrations arising as a result of the existing baseline added to the PC (the Predicted Environmental Concentration [PEC], or cumulative impact).

This method requires project emissions quantification, air dispersion modeling, and baseline air quality data. These analyses were not performed for this Project given the lack of available baseline air quality data and Project emissions quantification. There was also insufficient publicly available wind statistics data (hourly wind speed and direction) to generate a wind rose for the Project.

Therefore, a qualitative approach was used to determine the magnitude of air quality impacts. The qualitative determination of impact magnitude for air quality is based on the following significance criteria:

Duration of Impact: This impact only occurs during the production blow tests, which takes place for about two weeks at each well. Based on the short duration of impact, this criterion is categorized as *Small*.

Extent of Impact: Most of the nearby households/settlements are located 0.5 miles from the Project Site. Hydrogen sulfide is a dense gas, which tends to settle down quickly, and as such is not likely to disperse too far from its source. For example, under normal temperature and pressure (20˚C and 1 atmosphere of pressure), the densities of H_2S and air are 1.434 and 1.205 kg/m^3, respectively (The Engineering ToolBox, 2020). As H_2S will not disperse too far (i.e., localized), the extent of it impact is categorized as *Small*.

Intensity of Impact: Considering the potential exposure of onsite workers, nearby settlements, and ecological receptors to H_2S concentrations from exploratory activities, the intensity of impact is categorized as *Medium*.

Reversibility of Impacts: H_2S emissions will be dispersed in ambient air, and its concentration will be decreased when the construction stage is completed. Based on the reversibility of impacts, this criterion is categorized as *Small*.

The overall magnitude of air quality impacts is categorized as *Small to Medium*.

Sensitivity of Receptors

The sensitivity of receptors is determined based upon the nature of the receptor and the nature of the impact. The approach in this assessment assumes that the sensitivity for human health within the general population is *Medium.* As air quality standards are set to protect the most vulnerable individuals in society, there is inherently a margin of safety within them. There are a small number of specific cases where the sensitivity may be defined as High; these include where there are particularly vulnerable individuals (e.g., a hospital where there are intensive care wards and high dependency wards where patients are particularly sensitive to air pollution). For the purpose of this assessment, the sensitivity for human receptors is set at *Medium*.

For vegetation (an ecological resource), the sensitivity is defined on the basis of its designated importance as an ecological resource. As for human health, this assessment designates the importance of vegetation (e.g., various plant species, agricultural crops) within the Project area as *Medium*. Details on the types of plant species and agricultural crops near the Project area are provided in Section 5.3, Biodiversity Impact Assessment.

Therefore, combining a *Small* to *Medium* magnitude with a *Medium* sensitivity will result in an overall *Minor* to *Moderate* impact significance.

Mitigation Measures

To avoid or reduce the environmental/offsite and occupational exposure to geothermal gases (mainly H_2S that may cause health hazards and odor nuisance) during well drilling activities, the following mitigation measures will be implemented (aside from air pollution controls incorporated into Project design):

- Install an H_2S gas-monitoring network, taking into account the location of emissions sources and areas of community use and habitation. Operate the H2S gas monitoring system continuously to facilitate early detection and warning.
- If necessary, use abatement systems to remove H_2S emissions from non- condensable gases. Examples of H_2S controls include wet or dry scrubber systems or a liquid phase/oxidation system.
- Provide adequate ventilation of nearby low-lying occupied buildings to avoid H_2S accumulation.
- Provide workers with educational materials, training, and Personal Protective Equipment (PPE) to protect them from H_2S emissions.
- If H_2S monitoring identifies an offsite human health risk, nearby receptors (i.e., community members) that could be affected by H_2S emissions will be relocated.

Residual Impact (Post-mitigation)

The implementation of the above mitigation measures will reduce the H_2S concentrations onsite (worker exposure) and offsite (nearby communities) to acceptable levels and, as such, should reduce probable *Minor* to *Moderate* air quality impacts to *Minor*.

Air Quality Impact Summary

The impact significance of increases in H_2S concentrations during the Project activities will range from *Minor* to *Moderate* due to the *Small* to *Medium* air quality impact magnitude and a *Medium* sensitivity for human and ecological receptors. Overall, impacts associated with air quality range from *Minor* to Moderate under pre- mitigation conditions and *Minor* under post-mitigation conditions. The residual impacts will not pose a risk to surrounding communities provided the mitigation measures are implemented.

7.2.1.2 Noise (Exploration and Exploitation)

Introduction

This section presents an assessment of the Project impacts on the acoustic environment. The assessment methodology for noise, including standards and guidelines, prediction methodology, major noise activities, and impacts at closest receptor locations, is discussed in the following sections. Descriptions of receptor-specific impacts, impact significances, applicable mitigation measures, and residual significances during the construction and operation phases are also discussed.

Assessment Methodology

For most environmental impact topics/resources, an approach that combines impact magnitude with resource/receptor sensitivity is used to determine impact significance. This approach allows the use of a significance matrix that combines resource/receptor sensitivity with impact magnitude (as described in Section 7.1).

For noise, however, it is usually possible to predict noise levels quantitatively and compare them against standards that are resource-/receptor-specific and inherently take into account resource/receptor sensitivity. Furthermore, many numerical noise standards are noise source-specific (e.g., industrial noise is different from aircraft noise), some refer to baseline levels (i.e., allowable increases above baseline), and there can be a number of other factors that are relevant to determining impact significance. Thus, impact significance for noise is not determined using a magnitude versus sensitivity matrix, but is instead determined by comparison with accepted standards using the process outlined in the Figure below.

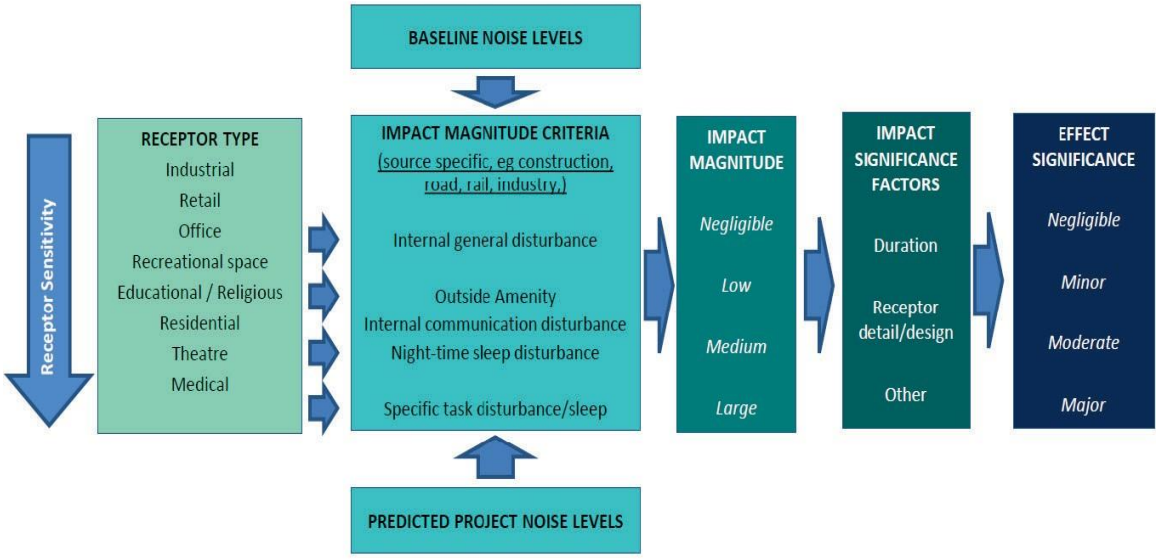


Figure 7-3: Noise Impact Assessment Process

Rather than applying a two-dimensional matrix for noise impact significance, the process for noise considers the type of receptor, draws on relevant standards or guidance to determine impact magnitude, and then considers other factors to determine significance.

There are no national noise standards in Saint Kitts and Nevis; therefore, the IFC limits for ambient/ airborne noise levels (IFC, 2007) were used in this assessment as the basis of 'significance thresholds' (see Table below).

Table 7-3: IFC Guidelines for Ambient Noise

Receptor	Maximum Ambient Noise Level, L_{eq}, 1 hour	
	Daytime (07:00-22:00)	**Nighttime (22:00-07:00)**
Residential, Institutional,	55	45
Industrial, Commercial	70	70

Source: IFC 2007.

Leq, 1 hour = statistical noise descriptor that represents the equivalent continuous sound pressure level over a 1-hour period;

dBA = A-weighted decibel.

In addition to the guidelines for sound contribution from a source at a receptor, the IFC also indicates that noise associated with a project will not cause the ambient noise level to rise by more than 3 dBA at the nearest off-site receptor. The IFC criteria are also relevant to long-term noise sources, and they represent very stringent assessment criteria for temporary activities such as construction and seismic survey work.

The IFC guidance summarized above has been reviewed to establish a suitable set of criteria for the proposed Project; the table below applies to construction and operation noise based on these standards. The duration of construction noise is accounted for by applying variable noise thresholds for significant impact.

Table 7-4: Noise Magnitude Criteria for Construction and Operation Activities in Residential Areas

Operating Period	Daytime Noise Levels L_{eq}, 1hour (dBA)				Nighttime Noise Levels L_{eq},1hour (dBA)			
Magnitude Rating	**Negligible**	**Small**	**Medium**	**Large**	**Negligible**	**Small**	**Medium**	**Large**
Construction								
Short term exposure <1 month	<70	70-75	>75-80	>80	<55	55-60	>60-65	>65
Medium term exposure	<65	65-70	>70-75	>75	<45	45-55	>55-60	>60
Long term exposure > 6	<55	55-60	>60-65	>65	<45	45-50	>50-55	>55
Operation								
Absolute noise	<50	50-55	>55-60	>60	<40	40-45	>45-50	>50

Leq, 1 hour = statistical noise descriptor that represents the equivalent continuous sound pressure level over a 1-hour period; dBA = A-weighted decibel; < = less than; > = greater than.

For airborne noise assessments, once impact magnitude is established, it is compared directly to the impact significance, considering duration and receptor detail (see Table below).

Table 7-5: Determination of Airborne Noise Impact Significance

Impact Magnitude Classification	Impact Significance Factors[a]	Impact Significance Rating
Negligible	Consider other influencing factors if necessary (e.g., duration, sound character)	Negligible
Small		Minor
Medium		Moderate
Large		Major

[a] Examples of factors that may influence significance, beyond that taken into account in the guidelines used to assess impact magnitude, include:

Duration of Impact – For example, a noise source may operate on an intermittent or repetitive basis for only part of a day or nighttime period, or on a limited number of days per week, or only during daytime, such that it may be appropriate to downgrade the significance rating.

- **Character of Noise** – Noise of a particularly distinctive character (tonal or impulsive) may be more disturbing than a broadband noise, so it may be appropriate to upgrade the impact significance.
- **Receptor Detail or Design** – Guidelines for noise assessment assumes receptors have openable windows to sensitive rooms overlooking the noise source. This may not always be the case, so that noise impacts on facades that have no windows to noise sensitive rooms (e.g., offices, bedrooms, living rooms) or have upgraded levels of sound insulation (with associated ventilation if necessary to keep windows closed) can often be downgraded.
- **Meteorological Conditions** – Regular occurrence of conditions (usually more than 30 percent of the time) that enhance noise propagation, such as prevailing light stable winds (less than 3 meters per second) and temperature inversions, may warrant upgrading the significance ratings.

Identification of Receptors

As described in Section 5.2.3 *Noise Baseline*, the Project Site is located primarily on two parcels at the Hamilton Estate, a former sugar cane plantation located on the western side of the island of Nevis. The area surrounding the parcels contains the remains of the Hamilton Estate sugar works and individual residences, which are located to the east, south and west of the Project Site.

For the purpose of this assessment, only the nearest residential receptors shown in the Figure below were assessed, as compliance at these receptors will also indicate compliance at other further potential receptors. The residential receptors include:

- Receptor A: A private residence located to the northeast of the plant site;
- Receptor B: A cluster of private residences located to the southeast of the plant site. A restaurant is located just north of this area;
- Receptor C: The casino Condominium and Gardens Complex located south of the plant site and east of the injection well site;
- Receptor D: A government housing project located to the southeast of the plant site and injection well site; and
- Receptor E: A private residence located west of the plant site and northwest of the injection well site.

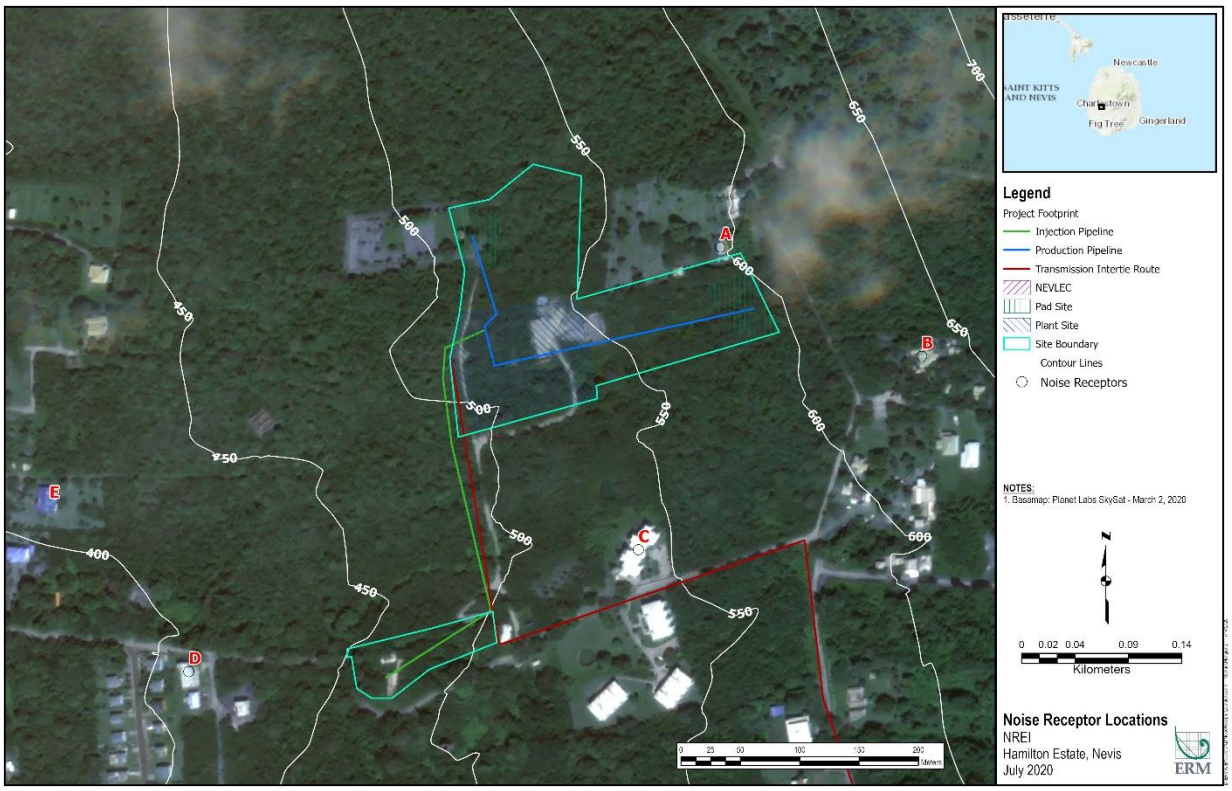


Figure 7-4: Nearest Residential Noise Receptors

Potential Airborne Noise Activities

Construction

As discussed in the 2017 EIA, Section 7.8.2 *Noise Impacts*, Project construction is anticipated to last 17 to 18 months and will involve the use of heavy equipment to clear and grade project parcels, construct the well pads and plant foundations, drill the two production wells and two injection wells, perform well testing, install the aboveground production and injection pipelines, assemble and install power plant equipment and related facilities (e.g., control room), and trench and install the underground transmission intertie line. In general, Project construction will proceed in phases in which one activity is finished before the next activity begins (e.g., clearing and grading will be completed before well pads are constructed); however, some phases could overlap slightly.

The Table below provides a summary list of typical equipment that could potentially be used during project construction activities and the corresponding noise levels associated with the equipment / construction activity as estimated by NREI in the 2017 EIA report, based on published noise data and information contained in the Project Description section.

In general, construction activities will occur during daylight hours; however, well drilling and testing will occur 24-hours a day in three locations for an estimated 40 days per location.

Table 7-6: Representative Project Construction Equipment Noise Levels

Equipment / Activity	Reference Noise Level at 50 Feet (L_{max})[1]	Percent Usage Factor[2]	Predicted Noise Levels (L_{eq}) at Distance (in Feet)[3]					
			50	125	250	375	500	1,0000
General Construction								
Bulldozer	85	40	81	73	67	64	61	55
Backhoe/Loader	80	40	76	68	62	59	56	50
Excavator	85	40	81	73	67	64	61	55
Pneumatic tools	85	50	82	74	68	64	62	56
Scraper	85	40	81	73	67	64	61	55
Delivery Truck	85	40	81	73	67	64	61	55
Well Drilling and Testing								
Well Drilling (with mud)	86	100	86	78	72	68	66	60
Well Cleanout	81	NA	81	73	67	70	61	55
Flow Testing	85	NA	85	77	71	68	65	59
Well Venting (1 hour or less)	106	NA	106	98	92	88	86	80

Source: Adapted from PIA, 2017.
[1] L_{max} noise levels based on manufacturer's specifications.
[2] Usage factor refers to the amount of time the equipment produces noise over the time period.
[3] Estimate does not account for any atmospheric or ground attenuation factors. Calculated noise levels based on Caltrans, 2009: L_{eq} (hourly) = L_{max} at 50 feet – 20log (D/50) + 10log (UF), where: Lmax = reference Lmax from manufacturer or other source; D =distance of interest; UF = usage fraction or fraction of time period of interest equipment is in use.

Operation

This will only be applicable for the exploitation phase. Operation would be part of the exploitation phase. During operation, the primary sources of acoustic noise will include the power plant equipment, pipelines,

and venting during startup and shutdowns (see Section 4.0 *Project Description for details*). The air-cooled condensers, which will use large fans to force air over thin fans containing the binary system working fluid, will produce the highest equipment levels.

During daytime hours when demand for electricity is higher, NREI assumes that all 24 air-cooled condensers will be operating. During nighttime hours when demand for electricity is lower, Nevis predicts that 12 air-cooled condensers will be operating.

Predicted Noise Levels and Mitigation Measures

Construction

As shown in the Table below and discussed in the 2017 EIA, clearing, grading, and well pad/plant foundation work will require equipment such as bulldozer, loader, scraper, compactor and trucks. All clearing, grading, and pad/foundation work will occur at least 125 feet or more from the closest residential receptor (Receptor A) and could produce noise levels of approximately 68 to 73 dBA from a single piece of equipment. However, most receptors will be located 375 feet or more from clearing and grading work, where the concurrent operation of two or more pieces of equipment will produce noise levels of approximately 62 to 67 dBA, which will be a medium to large magnitude/long term impact, because construction will occur over a 17-18 month period.

Additionally, the installation of the transmission line will involve construction equipment to trench and install the transmission line underground. Construction equipment noise will be similar to the construction associated with the production and injection well pipelines (55 to 62 dBA), but will be very short in duration (lasting just a few days at each point along the transmission intertie route).

As described in the 2017 EIA and 2020 Addendum to the EIA, and summarized in the table below, noise levels during well drilling and well venting will be the greatest during the construction activities. Well drilling primary noise sources will be the internal combustion engines and motors associated with the drilling equipment. Mud will circulate through the drill pipe using a mud pump. With the exception of Receptor A, which will be located approximately 185 feet from the northeast of the production well pad, all receptors will be located at least 500 feet or more from each of the drill sites. At this distance (500 feet), drilling with mud will generate a noise level of approximately 66 dBA. At a distance of 185 feet, well drilling will generate noise levels of approximately 73 dBA from Receptor A. These impact levels will represent a medium term/medium magnitude impact during the daytime, and a medium term/large magnitude impact during the nighttime.

NREI will construct an earthen berm associated with the installation of the drilling mud containment pond. This berm will be installed prior to well drilling activities and will provide sound shielding at the nearby receptors during well.

To minimize impacts at residential receptors from construction noise, NREI will implement the following noise mitigation measures:

- Install an earthen berm between drilling locations and residential receptor locations within 1,000 feet of the drill rig.
- Provide receptors within 1,000 feet of the project parcels written notice prior to the start of construction that describes the approximate schedule for the construction activities and a contact name and phone number for the construction contractor and NREI staff person responsible for handling construction-related noise complaints.
- Provide receptors within 1,000 feet of drilling sites at least one week's advance written notice of the start of well drilling, well venting, and well testing activities.

- Use a silencer or rock muffler during all well venting activities, including initial cleanout, as feasible.
- Implement the noise management plan that details noise monitoring requirements and noise complaint resolution recommendations.

These measures, where applicable, would also be applied during the exploration phase to mitigate noise levels.

Operation

This will only be applicable during the exploitation phase. To predict the noise impacts to nearby residential receptors, the noise levels around the power plant were modelled using the OpeNoise[110] model (see Appendix A of the of the Addendum to the 2017 EIA – a noise impact analysis of the Exergy binary cycle turbines and cooling system).

The Table below provides a summary of the results of the noise modeling by comparing the distances of the receptors and the predicted noise levels from daytime and nighttime operation of the air-cooled condensers (i.e., cells). Also included is estimate noise increases over ambient sound levels at the noise receptors.

Table 7-7: Comparison of Distances and Predicted Noise Levels from Daytime and Nighttime Operations of the Air-Cooled Condensers

Facility Operation - Daytime (24 Cells)						
Receptor ID	**Distance to Nearest Cell (feet)**	**Maximum Received Level (L_{Aeq})**		**Estimated Ambient Sound Level - Nighttime (dBA)**	**Increase over Background (dBA)**	
		Obstacles and Buildings Only	**Obstacles and Buildings with Vegetation Attenuation**		**Obstacles and Buildings Only**	**Obstacles and Buildings with Vegetation Attenuation**
A	93	49.0	39.4	40	9.5	2.7
B	232	47.2	25.5	40	8.0	0.2
C	147	51.7	36.6	40	12.0	1.6
D	374	43.1	4.4	40	4.8	ND
E	415	41.8	ND	40	3.9	ND
Facility Operation - Nighttime (12 Cells)						
	Distance to Nearest Cell (feet)	**Maximum Received Level (L_{Aeq})**		**Estimated Ambient Sound Level – Nighttime (dBA)**	**Increase Over Background (dBA)**	
		Obstacles and Buildings Only	**Obstacles and Buildings with Vegetation Attenuation**		**Obstacles and Buildings Only**	**Obstacles and Buildings with Vegetation Attenuation**
A	149	29.9	20.1	34	1.4	0.2
B	290	41.7	23.6	34	8.4	0.4
C	150	47.9	34.4	34	14.1	3.2
D	374	40.8	ND	34	7.6	ND
E	415	39.9	ND	34	6.9	ND

Source: Adapted from PIA, 2020. Background sound levels taken from ANSI, 2013.

L_{Aeq} = It is the A-weighted, equivalent continuous sound level in decibels measured over a stated period of time.

ND = not detectable. Facility will not contribute a detectable amount of noise at the receptor.

[110] OpeNoise (version 1.3, October 2019 release) in QGIS 3.10.0. The OpeNoise plugin is a 2D noise level modeling component that is Python-based operating within a GIS context. OpeNoise is a point source model adopted by the European Union that calculates direct and refracted linear sound levels from single or multiple point sources. The model takes into account the air temperature and humidity and allows inputs for obstacles and buildings. It provides for vegetation attenuation using a linear attenuation factor based on the type and density of vegetation. The vegetation attenuation used in the models was 4 dBA/100 feet of trees and dense bush.

To minimize facility sound levels and ensure that noise contributions at nearby receptors and increases in ambient noise comply with IFC guidelines, NREI will implement the following mitigation measures:

- Reducing the amount of air-cooled condensers operating during the nighttime period (10 PM to 7 AM) to the minimum amount necessary to safely and efficiently provide necessary electrical load requirements.
- Maintaining vegetative buffers and/or planting trees and other dense vegetation between the facility and noise receptors to increase soft ground cover and potential attenuation of noise levels.
- Implement the noise management plan that details noise monitoring requirements and noise complaint resolution recommendations.

Residual Impact (Post-mitigation)

NREI will implement the noise management plan (see ESMP Plan 5) during Project construction and operation. The noise management plan includes noise monitoring requirements during construction and operation to ensure that mitigation measures have been appropriately implemented as described above. The plan also includes recommendations for further mitigation if the results of the monitoring show noise levels in excess of IFC guidelines, including noise complaint resolution recommendations.

Noise Impact Summary

Temporary construction noise levels above the 55 dBA daytime noise guideline will be short-term and intermittent in nature and will only impact local receptors. Most construction activities will be limited to daytime hours only. Drilling activities, however, will occur continuously for an estimated 40 days at each well location and will therefore result in noise levels above both daytime and nighttime guidelines (55 dBA and 45 dBA, respectively). NREI has incorporated practices to reduce equipment noise, provide notification to receptors, and resolve noise-related complaints to address potential project noise levels.

Operational of the Project will generate noise on a continuous, long-term basis. Noise levels associated with operation will be lower at night, due to lower electricity demand. Based on noise modeling completed for the Project, and assuming proper implementation of noise mitigation measures, operation of the facility will comply with IFC daytime and nighttime standards, and will result in ambient noise increases at nearby receptors of less or about 3 decibels.

NREI will implement the noise management plan included in in the ESMP, which details noise monitoring requirements and noise complaint resolution recommendations.

7.2.1.3 Soils (Exploration and Exploitation)

Introduction

This section examines the impacts of the Project on soils. The key impacts considered is the potential increase of soil erosion as the result of soil disturbance from construction activities related to exploration, and eventually to exploitation, and the loss of forests by conversion to non-forest uses. The assessment followed the methodology described in Section 7.1, *General Methodology*.

Identification of Receptors

As described in Chapter 5.0, *Description of the Existing Environment*, the Project is located on a rural area on the southwest region of Nevis where forest is the predominant land use. The Project Site (i.e., Plant the ancillary facilities) will be located at the Hamilton Estates, a former sugar cane plantation, in a two parcels

that are approximately 2.4 km east of Charleston. The intertie transmission line will follow existing roads starting at Hamilton Estates, running through Blaziers Estate and Marion Heights before finishing at the Prospect Power Station via upper Stoney Grove. The transmission line will be installed in trenches, typically three to five feet deep, in a conduit encased in sand. The planned route to the Prospect Substation will be approximately 1.7 miles (2.8 kilometers).

The most common soil type in the Project area is the Charleston clay loam, which is the most widespread soil type in Nevis and found in gentler slopes below the main Nevis Peck mountain area. The landscape characteristics of the Project area, where this soil type is found and its textural characteristic (i.e., clay loam) make it to have a low-medium erosion potential and no prone to landslides (slopes in the area range from approximately 8 to 20 percent).

Relevant Project Activities and Key Potential Impacts

The construction and operation activities associated with the Project—including land clearance and grading—have the potential to impact the geomorphology, landscape, and soils of the Project area. The potential primary impacts could include soil erosion and soil contamination. In addition, the construction of production drill pads, injection pads, and auxiliary facilities will result in the loss of land with soils used, or that are suitable for forest use. A summary of the Project activities and potential impacts, by phase, is provided in Table 7-8.

Table 7-8: Summary of Relevant Project Activities and Potential Key Impacts on Soils

Project Activity	Key Potential Impact
• Land/vegetation clearance and grubbing • Topsoil removal and the nature of the underlying soils and rock that will be exposed • Excavation • Excavated material placement • Landscape grading and re-contouring • Soil stabilization and replacement • Heavy equipment movement during earthwork activities • Wastewater discharges from well pads during drilling and testing phases • Laying pipeline for water supply	• Potential increase in soil erosion (i.e., gully erosion) • Loss of land/soils suitable for agriculture • Potential contamination of soils due to accidental spills/releases •

Soil erosion, soil contamination, and loss of land/soils are potential negative impacts on soils of the Project area.

Implementation of the Project will result in the disturbance of approximately 4 hectares of soil. Table 7-9 provides a summary of the approximate hectares of soils that will be disturbed by the various Project components and associated facilities. Potential impacts to soils could result from the construction of the various canal facilities, site preparation (vegetation clearance and grubbing, landscape grading, and re-contouring to ensure proper drainage), and other construction activities.

Earthworks and well drilling activities will involve the use of equipment/vehicles that use fuels and lubricants, and generate some hazardous materials. Localized soil contamination can occur if this equipment does not receive proper and frequent maintenance or if a suitable area is not assigned for storage of hazardous materials, lubricants, and fuels.

Table 7-9: Summary of Approximate Hectares of Soils Disturbed by Project Construction

Project Facility	Approximate Area Disturbed (ha)
Plant Facility	3.30
Injection Well Site	0.40
Injection Well Pipeline	0.03
Transmission Electrical Line	0.26
Total	**3.99**

ha = hectare

Description of Sensitivity and Magnitude Designation

The criteria used for the impact assessment of soils are summarized below. Table 7-10 provides the criteria used to assign sensitivity levels for affected resources, while Table 7-11 provides the criteria used to assign magnitude levels for the types of impacts considered in this assessment. Once magnitude and sensitivity levels are assigned for each impact considered, the matrix presented in the table below is used to assign impact significance ratings.

Table 7-10: Sensitivity Criteria for Soils

Sensitivity	Description
Low	• Soils with low-medium erosion potential • Soils with low potential for compaction
Medium	• Soils with medium and/or high erosion potential that drain to water resources that support diverse aquatic habitats or are a locally important source of potable water for communities living nearby • Soils with medium potential for compaction
High	• Soils with medium and/or high erosion potential that drain to water resources that support economically important or biologically unique aquatic species or provide essential habitat for those species, or are an important source of potable water and/or for navigation • Soils with high potential for compaction

Table 7-11: Magnitude Criteria for Soils

Magnitude	Description
Soil Erosion, Soil Contamination, Soil Compaction	
Negligible	• Disturbance of soils with low erosion potential and in landscapes with slopes < 20 percent • Disturbance of soils with low compaction potential

Small	• Greater than 0% but less than 25% of soils disturbed have a medium or high erosion potential and are in landscapes with slopes 20 to 40 percent. • Greater than 0% but less than 25% of soils disturbed have high compaction potential
Medium	• 25% to 50% of soils disturbed have a medium or high erosion potential and are in landscapes with slopes 20 to 40 percent. • 25% to 50% of soils disturbed have a high compaction potential
Large	• More than 50% of soils disturbed have a medium or high erosion potential and are in landscapes with slopes 20 to 40 percent. • More than 50% of soils disturbed have a high compaction potential

Description of Impacts, Mitigation, and Residual Impacts

One of the primary concerns during construction activities is soil erosion. Potential impacts to soils from erosion are expected to primarily occur in areas where the slopes are moderately steep or steep (i.e., 20 to 40 percent slopes). Based on the regional geomorphology and topography characteristics, there are areas within the Project footprint that have slopes in the range approximately of 8 to 20 percent and where the erosion potential of the soils due to their characteristics (clay loam) is *Low-Medium*. The significance of soil erosion is characterized *Negligible* based on the *Negligible* magnitude of the impact and Low sensitive ratings of the receptor.

To further reduce the construction-related soil erosion impacts, the following mitigation measures will be carried out:

- Develop and implement a Soil Erosion and Sediment Control Plan including control measures such as the use of silt fences, installation of temporary and permanent drainage systems to manage water runoff from the construction areas, and use of sediment basins;
- Use appropriate best management practices during clearance activities, to the extent practicable, such as: schedule construction activities during the dry season, especially on sloped areas; limit clearing and disturbance to the approved work zone area only; minimize the area of bare soil at any one time within the approved work zone as much as possible; and progressively stabilize and revegetate disturbed areas; and
- Reuse excavated material for slope stabilization of the exploration drilling and injection pads.

Project construction will require the use of equipment and vehicles to conduct earthworks, clearing, grubbing, and drilling activities. Accidental spills from this equipment, from vehicles, and from areas assigned to store fuels, lubricants, and hazardous materials could occur, which will result in soil contamination. The significance of soil contamination due to spills is *Negligible* considering the *Negligible* magnitude of the impact due to its local extent, uncertain likelihood, and temporal duration; and *Low* sensitivity of the receptors (soils).

To further reduce the construction-related soil contamination impacts, the following mitigation measures will be carried out:

- Implement a Spill Prevention Control and Countermeasures (SPCC) Plan to minimize the risk of spills and ensure an appropriate response in the event of a spill. This Plan will include:

  Preventive maintenance programs for equipment and vehicles (according to manufacturer requirements); and

Properly stored and use of fuel and hazardous materials in assigned areas that control potential accidental spills,

- Inject geothermal fluids into injection wells;
- Provide appropriate facilities/containers for segregation and temporary storage of general wastes onsite; and
- Establish site-specific processes for material, handling (receipt, unloading), storage, transportation, and disposal (including recycling/reuse options).

Based on implementation of these measures, the magnitude of soil contamination impacts due to spills is expected to be reduced to Negligible, and the significance will be reduced to Negligible.

The potential impact of the Project to soils suitable for agriculture (forest, agriculture) uses consists of the loss by conversion to non-agriculture uses. The impacts to agriculture soils within the Project area are assessed as *Negligible* because the total area of soils suited for agriculture use that will be permanently impacted by conversion to non- agriculture uses is approximately 4 hectares of the soils impacted (Negligible magnitude). The impacted areas consist of soils that do not drain to water resources that support diverse aquatic habitats (Low sensitivity).

Even though the significance of land conversion impacts is considered *Negligible*, the following mitigation measures will be carried out:

- Stabilize disturbed areas with vegetation or other means to minimize soil erosion; and
- Replace topsoil in the excavated material placement areas to approximate the existing geomorphology and landscape/topography and grade and re-contour to ensure proper drainage.

Soils Impact Summary

Overall, impacts associated with soil are *Negligible* under pre-mitigation conditions and *Negligible* under post-mitigation conditions.

7.2.1.4 Water Resources (Exploration and Exploitation)

Introduction

This section presents the evaluation of Project impacts on water resources located within the Project area. The significance of the potential impacts on water resources (surface and ground) were evaluated by considering the magnitude of potential changes in hydrologic patterns, water consumption, and changes in surface and groundwater quality. While there will be some impacts to water resources during exploration (i.e. those that refer to testing activities), they are limited in scope, with the majority of impacts occurring during the exploitation phase during construction and plant operation.

Identification of Key Receptors

As described in Chapter 4.0, *Description of the Proposed Project*, water requirements for the Project, for well drilling, filling the facility firewater tank and utility water for the control room will be available through a connection to a 10 cm (4-inch) water utility water main north of the site. This will provide up to 946 liters per minute to fill the drilling sump and will provide most of the water supply for drilling and plant operations. Supplemental water from the Hermitage Heights Tank Farm near Charleston, approximately 1.6 km west of the site, will be delivered by truck.

The Project Site is located within the Island of Nevis coastal aquifer, where the geology is characterized by undifferentiated pyroclastic deposits associated with past Nevis Peak eruptions. Due to shallow clay soils underlain by a silica pan and rapid runoff through ghauts, groundwater recharge of groundwater form infiltration is poor. Groundwater within the Project Site has not yet been studied in detail, and there is limited or no available information regarding groundwater levels or quality. There are not surface fresh water sources or stream/ghauts nearby the Project Site that may be potentially affected by the proposed Project.

Relevant Project Activities and Key Potential Impacts

The construction and testing activities and operations associated with the Project may result in negative impacts to water resources within the Project Site (a detailed description of proposed Project features and activities is provided in Chapter 4.0, Description of the Proposed Project). Potential impacts could include changes to downstream surface runoff patterns and changes in surface and groundwater quality. The table below summarizes the activities and potential impacts associated with the Project.

Table 7-12: **Summary of Relevant Project Activities and Potential Key Impacts on Water Resources**

Project Activity	Key Potential Impact
Construction • Drill site preparation (i.e., earthwork, clearing, and grubbing works) • Drill rig installation and drilling • Injection of geothermal fluids **Operation** • Consumption and disposal of geothermal fluids • Use of store hazardous materials	• Alteration of drainage patterns – changes to downstream surface runoff patterns • Potential degradation of surface and groundwater quality due to accidental spills/releases or geothermal fluids • Water consumption during drilling

Description of Sensitivity and Magnitude Designation

Based on construction and testing and operation activities related to the Project, as well as sensitivity factors defined by socioeconomics (*see Section 7.4, Socioeconomic Impact Assessment, for more details*), ERM identified groundwater as a resource sensitive receptor. Groundwater was identified as a sensitive receptor as drilling/injection activities have the potential to alter groundwater quality. The table below shows a description of sensitivity designation of groundwater in the Project Site.

For purposes of this assessment, the sensitivity designation of groundwater as a receptor to impacts from the Project is classified as *High* due to the use of groundwater as a source for drinking water.

Table 7-13: Description of Sensitivity Designation for Groundwater

Sensitivity	Description
Low	Groundwater has little or no role in terms of provisioning or services for the local community.
Medium	Groundwater has local importance in terms of provisioning services, but there is ample capacity and/or adequate opportunity for alternative sources of comparable quality.
High	Groundwater is wholly relied upon locally, with no suitable technically or economically feasible alternatives, or is important at a regional or transboundary watershed level for provisioning services.

The table below presents a description of magnitude criteria for impacts on groundwater quality.

Table 7-14: Description of Magnitude Criteria for Groundwater Quality Resources

Magnitude	Description
Negligible	• Groundwater quality impacts are likely to be well within ambient ranges or allowable criteria. • Short-term localized effects on groundwater quality but likely to be highly transitory (i.e., lasting a matter of hours) and well within natural fluctuations. • There are no known/expected downgradient groundwater users within the watershed that could be affected by the Project.
Small	• Groundwater quality impacts are likely to be within ambient ranges or allowable criteria and have no effects offsite. • Short-term localized effects on groundwater quality, but which are likely to return to equilibrium conditions within a short timeframe (i.e., hours or days at most) • There are known/expected downgradient groundwater users within the watershed, but their supplies may not be compromised by the Project.
Medium	• Groundwater quality impacts are likely to result in occasional exceedances of ambient ranges or allowable criteria and extend off-site. • Localized effects on groundwater quality that are likely to be fairly long- lasting (i.e., weeks or months) and/or give rise to indirect ecological and/or socioeconomic impacts • There are known/expected downgradient groundwater users within the watershed, and their supplies may be compromised by the Project under certain (i.e., drought or seasonal low flow) conditions.
Large	• Groundwater quality impacts are likely to routinely or permanently exceed ambient ranges or allowable criteria over large areas and affect off-site users. • Severe effects on groundwater quality that are likely to be long-lasting (i.e., months or more), permanent, and/or give rise to indirect ecological and/or socioeconomic impacts • There are known/expected downgradient water users within the watershed, and their supplies are likely to be compromised by the Project at most times.

Description of Impacts, Mitigation Measures, and Residual Impacts

Construction

As described in detail in the 2017 EIA, Section 4.14.2 *Water Resources Impacts*, Project construction activities, could potentially degrade groundwater quality during construction and drilling activities. The clearing and grading of work areas could lead to off-site sedimentation. In addition, the use of heavy, diesel-powered construction equipment to construct the project facilities will require the on-site storage and use of diesel fuel, lubricating oil, solvents, hydraulic fluid and other materials that could leak or accidentally be released to the environment. Well drilling and testing will result in the release of geothermal fluids that contain boron, chlorine, and other constituents that could be harmful to drinking water or the environment if an uncontrolled release were to occur.

The significance of impacts on groundwater quality is *Moderate* based on the *Small* magnitude of the impact due to its local extent, uncertain likelihood, and temporal duration; and *High* sensitivity of the receptor. The significance of impacts on groundwater quality could be reduced from *Moderate* to *Negligible-Minor* if appropriate mitigation measures are implemented. NREI has designed the Project to minimize and control the potential degradation groundwater quality during construction and well drilling activities in the following ways:

- Implement a Soil erosion and Sediment Control and Drainage control plan;
- Store all fuels, lubricants, and other hazardous materials used in construction equipment in appropriate storage tanks and that will be located in bermed areas to provide secondary containment. The berms

around these areas will contain spills and prevent them from migrating off-site. NREI will also maintain appropriate and cleanup materials on site so that the spilled material will not leave the wellpads or power plant site;

- Adopt and implement an SPCC Plan to minimize the potential for accidental spills; and
- Drilling muds and additives that NREI will use during well drilling will be nontoxic and biodegradable and diluted by water during drilling, to the extent as practicable.

In addition, as described in the 2017 EIA, the proposed production and injection wells will be drilled to a depth of approximately 4,000 feet below the ground surface. To prevent geothermal fluids from coming in contact with fresh groundwater near the surface, NREI will case and cement the production and injection wells to at least a depth of 3,000 feet. This will contain the geothermal fluids within the well structure, fill the space between the casing and the surrounding material, prevent leaks from the joints, and isolate the geothermal fluids from the groundwater aquifers.

Operation

As described in detail in the 2017 EIA and similar to construction, and Project operation will have the potential to degrade groundwater quality in several ways. The control of microbiological growth and pH in the wells and heat exchangers will require the storage of additives, and plant equipment will require the storage of fuels and lubricating oil, which have the potential to spill onsite and be conveyed off-site by surface water flows and potentially contaminate the groundwater. In addition, the binary plant working fluid, n-pentane, could leak from equipment or be released during an accident or upset condition. Finally, geothermal fluids could also leak from wells or pipelines during accident or upset conditions.

As in the case of construction, the significance of impacts on groundwater quality from operation activities is *Moderate* based on the *Small* magnitude of the impact due to its local extent, uncertain likelihood, and temporal duration; and *High* sensitivity of the receptor. The significance of impacts on groundwater quality could be reduced from *Moderate* to *Negligible-Minor* if appropriate mitigation measures are implemented. NREI has designed the project to minimize and control the potential degradation groundwater quality during project operation in the following ways:

- Store all potentially hazardous materials used during plant operations in appropriate storage devices that will be located in bermed areas to provide secondary containment. NREI will also maintain appropriate and cleanup materials on site so that spilled materials can be cleaned up immediately and prevented from migrating off-site;
- Adopt and implement an SPCC Plan to minimize the potential for accidental spills;
- The proposed plant facility include secondary containment with capacity to hold the full volume of n-pentane held in the plant equipment. This containment system will include valves that will remain shut during normal plant operation to prevent spills of n-pentane and geothermal fluids from travelling off site. Spills of the n-pentane from the plant site will be captured in this area and reused to the maximum extent possible. Spills of geothermal fluids will be pumped to the brine containment pond, where the fluids will evaporate or be pumped to the injection well; and
- The proposed plant includes a 350,000-gallon brine containment pond that will be able to collect and contain two hours of full geothermal fluid flows during an accident or upset condition. The brine containment pond will collect and control the release of geothermal fluids from a discharge point after the steam separator, as well as from equipment further downstream in the plant site (the fluids will be pumped to the containment pond from these downstream points, which will release the fluids to the plant's secondary containment system. Geothermal fluids collected in the containment pond will be allowed to evaporate or be pumped to the plant's injection well.

Water Resource Impact Summary

Overall, impacts associated with groundwater quality are *Moderate* under pre-mitigation conditions and Moderate to *Negligible-Minor* under post-mitigation conditions.

7.2.1.5 Natural Hazard Risk Assessment (Exploration and Exploitation)

Due to its geographic location, Nevis is exposed to meteorological and geophysical threats such as hurricanes and tropical storms, coastal flooding, volcanic eruptions, and earthquakes (see Section 5.2-7, Natural Hazards). These impacts will exist regardless of the phase of the Project, so they apply to both the exploration and exploitation stages.

The Project itself is vulnerable to these natural disasters, which could affect the Project during construction and operations. Natural hazards also pose a risk to Project workers. For example:

- **Hurricanes and Tropical Storms:** Nevis is located within the Atlantic Tropical Cyclone basin. In the past, hurricanes have caused significant damage to Saint Kitts and Nevis and its infrastructure. A high category hurricane can damage Project facilities due to high wind and heavy rains.
- **Volcanic eruptions:** The Mount Nevis volcanic center is an active volcanic zone where hot springs and fumaroles are active and seismic swarms have occurred. A volcanic eruption will result in dome-collapse pyroclastic flows and associated surges, and ash/tephra fall; and volcanic gases emissions (CO_2, H_2S, SO_2). These effects could damage Project facilities and associated infrastructure, limit or block access to the site, and threaten worker safety.
- **Seismic events:** Nevis is regularly exposed to low-level earthquake activity related to shallow origins associated directly to the tectonic interaction of the Caribbean and Atlantic tectonic plates and indirectly from volcanic activity associated these tectonic plates. Large earthquakes are uncommon but owing to the proximity of plate boundaries, they are a possibility for Nevis. In November of 2007, an earthquake of 7.3 magnitude in the Richter scale occurred off the coast of Martinique. A large seismic event could cause damage to Project facilities, and worsen impacts to the environment.

Careful attention in the design of Project components must be taken to ensure the Project is resilient to these natural disasters.

As part of, and in addition to, risk prevention measures, there will be plans in place to assure emergency preparedness and response. During Project activities, NREI and the Drilling Contractor will implement and follow an Emergency Response Plan that describes procedures to be implemented both in the event of a forecasted event (e.g., hurricane or tropical storm) or an unanticipated event (e.g., earthquake). This will involve securing equipment and materials, stabilizing disturbed areas, and similar actions as well as procedures for site evacuation.

The Lesser Antilles region is a seismically active area with hundreds of earthquakes per year; however, Nevis has not been an epicenter of any recent significant earthquakes (see Section 5.2-7, Natural Hazards). Geothermal production results from the extraction or circulation of geothermal fluids and/or steam from a geothermal reservoir. Induced micro-seismicity occurs when fluid pressure in a fault or fracture reaches a critical value above which the friction preventing fault slip is overcome (Cladouhos et al., 2013). It has been reported in some cases where engineered geothermal development is carried out in seismic active zones; however, it is very site-specific, related to the geological conditions of each project area (Bayer et al. 2013). In most cases, micro-seismic events have been of relatively small magnitude (i.e., magnitudes of less than 2.0), and by the time the energy reaches the surface, the vast majority are rarely felt. According the U.S. Department of Energy's Protocol for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems (2012):

> although to date there is no recorded instance of a significant danger or damage (significant is defined here as damage that will affect a structure's physical integrity; this is not to say that seismicity has not caused less severe damage such as cracks in walls or similar damage) associated with induced seismicity related to geothermal energy production, the introduction of enhanced geothermal system technology in populated areas could be regarded by some as …a potential annoyance factor.

A common practice to identify and monitor the risk of induced micro-seismicity is to establish a local seismic monitoring program. NREI will install a Project seismic monitoring program or connecting with the existing Nevis, Gingerland Eastern Caribbean Seismic monitoring network (https://www.fdsn.org/networks/detail/TR/) to obtain accurate baseline of seismic activity. During operations, it will allow monitoring any changes related to the project and, if necessary, work as an early warning system and provide information to adjust the production plan (e.g., temporarily stop extraction of geothermal fluids). Due to the relative small magnitude of induced micro-seismicity, instrumentation will be able to detect events at least as small as magnitude 1.0, (U.S. Department of Energy, 2012). The monitoring program will also provide project-specific data in the event the Project-Affected Communities or other Project stakeholders are concerned regarding induced seismicity.

7.2.2 Physical Resources Impact Summary

The table below shows a summary of physical resources impacts pre and post mitigation.

Table 7-15: Physical Resources Impact by Receptor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
Groundwater	Water quality	High	Small	Moderate	**Construction:** • Implement a Soil erosion and Sediment Control and Drainage Control plan; • Store all fuels, lubricants, and other hazardous materials used in construction equipment in appropriate storage tanks and that will be located in bermed areas to provide secondary containment; • Adopt and implement an SPCC Plan to minimize the potential for accidental spills; and • Drilling muds and additives that will be used during well drilling will be nontoxic and biodegradable. **Operation:** • Store all potentially hazardous materials used during plant operations in appropriate storage devices that will be located in bermed areas to provide secondary containment; • Adopt and implement an SPCC Plan to minimize the potential for accidental spills; • The proposed plant facility will include secondary containment with capacity to hold the full volume of n-pentane held in the plant equipment; and • The proposed plant will include a 350,000-gallon brine containment pond that will be able to collect and contain two hours of full geothermal fluid flows during an accident or upset condition.	Negligible - Minor
Soil	Soil erosion and landslides	Low	Negligible	Negligible	Plant vegetation along steep slopes; Prepare and implement a Soil Erosion and Sediment Control Plan; Use appropriate best management practices during clearance activities; Reuse excavated material.	Negligible

	Soil contamination	Low	Small	Negligible	Preventive maintenance programs for equipment and vehicles (according to manufacturer requirements); Properly store and use of fuel and hazard materials; Control soil erosion in construction areas (hay bales and silt fences); Inject geothermal fluids.	Negligible
	Loss of soils suitable for agriculture	Low	Negligible	Negligible	Minimize Project footprint to the maximum extent possible; stabilize disturbed areas.	Negligible
Air Quality	Potential increase in H_2S concentrations (health hazard, odor nuisance)	Medium	Small to Medium	Minor to Moderate	Use abatement systems to remove H_2S emissions from non- condensable gases. Install an H_2S gas- monitoring network, taking into account the location of emissions sources and areas of community use and habitation. Provide adequate ventilation of nearby low-lying occupied buildings to avoid H_2S accumulation. Provide workers with educational materials, training, and PPE.	Minor
Noise	Increase in noise levels	Medium	Medium	Moderate	Noise Management Plan	Minor
Natural Hazards	Occurrence of natural hazards.	Medium	Medium	High to Moderate	Emergency Response and Preparedness Plan	Minor

7.3 Biodiversity Impact Assessment (Exploitation Phase)

This section describes the Project impacts on terrestrial biodiversity of the Project Area (immediate area of the Project) and the Project Biotic Area of Influence (BAOI) due to construction and operations phases of the Project. Information within Chapter 4, Project Description, and Chapter 5, Biodiversity Baseline, was used to assist the evaluation of the potential impacts and their significance. The receptors selected to assess these potential impacts include terrestrial vegetation, habitat, and wildlife; rare and endemic species; and protected areas. These receptors encompass the key terrestrial biodiversity components in the Project BAOI, which covers approximately 203 hectares (ha). The proposed Project will result in a total of approximately 5 acres of habitat loss (i.e., clearing and grading on the parcels and the associated 0.4-acre transmission intertie route) and 2.2 acres for temporary construction laydown areas (PIA, Addendum to EIA 2020). The impacts to biodiversity consider the pre-existing state and baseline influencing factors described in Chapter 5 (i.e. disturbed habitat due to grazing of domesticated animals and the presence of invasive species, disturbance due to previous tilling for sugar cane cultivation, etc.).

7.3.1 Methodology

The methodologies specific to Biodiversity presented in this section build upon the general assessment methodology summarized in Section 7.1, *General Methodology,* which combines a receptors' sensitivity, vulnerability, or importance, and the magnitude of potential impacts to determine significance of the impact. The general methodology has been tailored to the specific biodiversity impacts arising from Project activities. This assessment takes into account the intensity of disturbance, the frequency and duration of the impact to determine the magnitude to evaluate seasonal movements and behaviors.

7.3.1.1 Predicting Sensitivity, Vulnerability, or Importance of Impacts

Table 7-16 provides a summary of the criteria used to assess the importance of biodiversity receptors for this analysis.

Table 7-16: Criteria for Determining Biodiversity Receptor Importance

Importance	Characteristics
Low	Modified habitat and species of non-native origin, and/or where human activity has substantially changed an area's primary ecological functions and species composition; areas with no protected designation or recognition under local, national, or international laws or treaties; habitats and species that are of low conservation interest based on expert opinion
Medium	Largely natural habitat of viable assemblages of plant and/or animal species of largely native origin; species that are endemic, or nationally restricted range species; nationally important concentrations of migratory or congregatory species; and the habitats of significant importance to these species., and/or species that are protected under local, national, or international laws or treaties or otherwise recognized by experts as having conservation interest; species listed on the IUCN Red List of Threatened Species as Vulnerable (VU), Near Threatened (NT), or Data Deficient (DD);
High	Habitats and species that are protected under local, national, or international laws or treaties or otherwise recognized by experts as having high conservation importance; species listed on IUCN Red List of Threatened Species as Critically Endangered (CR) or Endangered (EN); locally endemic species; regionally or globally important concentrations of migratory or congregatory species.; the habitats of significant importance to these species; and habitat or species that meets IFC PS 6 criteria for critical habitat.

Source: ICUN = International Union for the Conservation of Nature

Based on the above criteria, the biodiversity receptors used in this assessment have the following importance ratings:

- Terrestrial Vegetation and Habitat – *Low* to *Medium* importance as vegetation is characterized as modified and natural within the Project Area and the BAOI. The Project Area was previously a cultivated area of sugar to cotton to vegetables, and later used for domesticated animal grazing. Baseline records of the direct Project Area documented various levels of modified habitat and maturity of regrowth of secondary scrub and deciduous forest, considered natural habitat, and areas cleared of vegetation.
- Terrestrial Wildlife – *Medium* importance as native wildlife associated with natural habitat occur in the Project Area and BAOI. According to the 2017 EIA and Chapter 5: Biodiversity Baseline, the wildlife recorded within the Project Area include seven species of birds, two species of bats, which are Least Concern (LC) according to the IUCN Red List (2020), and introduced mammals. Apart from insects, birds are the most common type of fauna found on Nevis. Additionally, Nevis serves as a stopover island along the spring northward migration for many birds. Additionally, three Near threatened (NT) species potentially occur within the BAOI, and of the Vulnerable and Endangered species, their associated habitat requirements are not located within the Project Area or the BAOI
- Rare and Endemic[111] Species –*Medium* importance as one bird, the Lesser Antilles Bullfinch (*Loxigilla noctis*, LC) and one bat, the Antillean Fruit-eating Bat (*Brachyphylla cavernarum, LC),* a Antillean endemic, occur within the Project area. In addition, the BAOI potentially supports 11 species that are endemic to the Lesser Antilles Islands. These include two bats (*Ardops nichollsi* and *Monophyllus plethodon*), four birds (*Eulampis holosericeus, Orthorhyncus cristatus, Myiarchus oberi,* and *Cinclocerthia ruficauda),* and five herpetofauna (*Eleutherodactylus johnstonei, Pholidoscelis erythrocephalus, Anolis bimaculatus, Sphaerodactylus sputator,* and *Antillotyphlops monastus)* that are endemic to the Lesser Antillean islands. Of these all are LC, with the exception of two Near Threatened (NT) restricted-range (<20,000 km^2) reptiles, St Christophers Ameiva (*Pholidoscelis erythrocephalus)* and the Leeward Blindsnake (A*ntillotyphlops geotomus*). Flora endemics include 45 plant species that potentially occur within the BAOI.
- Protected Areas – *Low/Medium* importance because there are no officially protected areas in Nevis. The nearest Protected Area is a marine management area that surrounds the island. Additionally, a proposed national park encompassing Nevis Peak, formally named the Nevis Peak Protected Area (NPPA) is stated to extend from approximately 300 m contour up to Nevis Peak at an elevation of 985 m. The Project Area is located around 150 m asl, while the BAOI extends to about 300 m asl (the southern edge of the proposed NPPA).

7.3.1.2 Predicting Magnitude

Magnitude essentially describes the nature and degree of change that the potential impact is likely to impart upon the resource/receptor. Depending on the impact, magnitude is a function of some or all of the following impact characteristics:

- Geographical extent;
- Intensity of impact to the receptor;
- Frequency of Project activity causing impact; and
- Duration of impact

[111] Endemism is defined, for the purpose of this ESIA, as occurring only within the Lesser Antilles islands, which include Antigua and Barbuda, Barbados, Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, St Vincent and the Grenadines and Trinidad and Tobago.

The magnitude of an impact takes into account the various dimensions of a particular impact to determine where the impact falls on the spectrum (in the case of adverse impacts) from Negligible to Large. Some impacts will result in changes to the resource/receptor that may be immeasurable or undetectable. Such changes are characterized as having a *Negligible* magnitude. The magnitude of each potential impact is assigned one of the following five ratings:

- Positive;
- Negligible;
- Small;
- Medium; or
- Large.

The characteristics of each magnitude rating is described below in Table 7-21.

One of two possible geographical extents characterized each potential impact:

- Project Area, or
- BAOI.

The definitions for duration, frequency and intensity designations used throughout the IA are provided in Table 7-17 to Table 7-19.

Table 7-17: Definitions for Duration Designations of Impact

Duration Designation	Definition
Short-term	Limited to construction activity (a few days to a few months)
Medium-term	More than a month but less than a year in aggregate
Long-term	More than 1 year in aggregate

Table 7-18: Definitions for Frequency Designations of Impact

Frequency Designation	Definition
Episodic	Once to occurring occasionally and at irregular intervals
Continuous	Occurring more than occasionally or at regular intervals

Table 7-19: Definition of Intensity Designations

CRITERION	DEFINITION

Intensity	*Negligible*: No Project-related change on species or disturbance is only within a very limited area.
	Low: Limited Project-related disturbance or injury of species is perceptible, potentially causing slight changes to wildlife behaviour.
	Medium: Project-related disturbance or injury of species is evident, potentially leading to limited mortality or impacts on life functions (e.g., feeding, breeding, growing).
	High: Project-related disturbance or injury of species is sufficient to cause extensive mortality or chronic behavioural changes at a population level.

To establish a consistent basis for assigning magnitude ratings of the various impact characteristics (i.e., geographical extent, intensity, frequency, and duration), each of the possible combinations of characteristic designations was assigned a magnitude rating. Table 7-20 lists the various combinations of impact characteristics and the corresponding magnitude ratings assigned for each combination. Table 7-21 lists the definitions of these magnitude ratings.

Table 7-20: Impact Prediction and Evaluation Process

Direct Impacts

Intensity	Frequency	Duration	Overall Magnitude Rating
Negligible	Episodic	Short-term	Negligible
		Medium-term	
Low	Episodic	Short-term	Negligible
		Medium-term	Small
Medium	Episodic	Short-term	Negligible
		Medium-term	Small
High	Episodic	Short-term	Medium
		Medium-term	
Negligible	Episodic	long-term	Negligible
Low	Episodic	long-term	Small
Medium	Episodic	long-term	Small
High	Episodic	long-term	Medium
Negligible	Continuous	Short-term	Negligible
		Medium-term	
Low	Continuous	Short-term	Small
		Medium-term	
Medium	Continuous	Short-term	Small
		Medium-term	Medium
High	Continuous	Short-term	Medium
		Medium-term	
Negligible	Continuous	long-term	Negligible
Low	Continuous	long-term	Small
Medium	Continuous	long-term	Medium
High	Continuous	long-term	Large

Indirect Impacts

Intensity	Frequency	Duration	Overall Magnitude Rating
Negligible	Episodic	Short-term	Negligible
		Medium-term	
Low	Episodic	Short-term	Small
		Medium-term	
Medium	Episodic	Short-term	Small
		Medium-term	Medium
High	Episodic	Short-term	Medium
		Medium-term	Large
Negligible	Episodic	long-term	Negligible
Low	Episodic	long-term	Small
Medium	Episodic	long-term	Medium
High	Episodic	long-term	Large
Negligible	Continuous	Short-term	Negligible
		Medium-term	
Low	Continuous	Short-term	Small
		Medium-term	Medium
Medium	Continuous	Short-term	Medium
		Medium-term	
High	Continuous	Short-term	Medium
		Medium-term	Large
Negligible	Continuous	long-term	Negligible
Low	Continuous	long-term	Small
Medium	Continuous	long-term	Large
High	Continuous	long-term	Large

Table 7-21: Definitions for Assessing Impact Magnitude on Biodiversity Resources (Habitats and Species)

Magnitude	Characteristics
Negligible	Effect is within the normal range of natural variation for the affected habitat or the populations of affected species.
Small	Affects only a small area of habitat, such that there is no loss of viability or function of the habitat. Effect does not cause a substantial change in the populations of affected species or other species dependent on them.
Medium	Affects a portion of a particular habitat, but does not threaten the long-term viability or function of the habitat. Effect causes a substantial change in abundance and/or reduction in distribution of a population over one or more generations, but does not threaten the long-term viability of that population or any population dependent on it.
Large	Affects the entire habitat, or a significant proportion of it, and the long-term viability/function of the habitat is threatened. Affects the entire population of a particular species or subspecies, or a significant part of it, causing a substantial decline in abundance, and/or change in and recovery of the population (or another dependent on it) is not possible either at all or within several generations due to natural recruitment (reproduction, immigration from unaffected areas).

Source: ERM, 2020

7.3.1.3 Evaluating Impact Significance

For potential impacts associated with planned activities of the Project, the significance of each potential impact is assigned based on evaluation of the magnitude of the impact and the sensitivity/vulnerability/importance of the resource/receptor. The matrix depicted in Table 7-22 (from section 7.1) is used for assigning impact significance ratings. The assignment of a significance rating enables decision-makers and stakeholders to understand and prioritize key potential Project impacts and consider what mitigation measures may be warranted.

Table 7-22: Evaluation of Significance of Impacts

Impact Significance Matrix		Sensitivity / Vulnerability / Importance of Resource/Receptor		
		Low	**Medium**	**High**
Negative Impacts				
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major
Positive Impacts				
Magnitude of Impact	N/A	Positive	Positive	Positive

7.3.1.4 Defining Direct and Indirect Impacts

Impacts to biological resources can be divided into two broad categories: direct and indirect. Direct impacts consist of physical disturbance or damage to a habitat or species. Examples include, but are not limited to:

- Disturbance or loss of habitat;
- Mortality or injury to individuals (particularly species of conservation concern); and
- Habitat fragmentation.

Indirect impacts occur when Project-related activities affect biological resources in a manner other than a direct loss of the resource. Examples include, but are not limited to:

- Disturbance of wildlife, leading to displacement of wildlife from suitable habitats;
- Changes in an individual's or population's habitat use or life history pattern due to disturbance from increased noise, vibration, lighting, human activity, visual disturbance, or transportation activity;
- Increased competition for resources or habitat due to displacement of individuals from the affected area into the territory of other animals;
- Degradation of water quality leading to impacts on aquatic biota; and
- Increased hunting/fishing pressure due to human population influx.

Direct and indirect impacts to biodiversity can occur during the following Project activities:

- Access improvements and transportation, which may result in vegetation loss, noise, and vehicular mortality;
- Drill site preparation, which will result in vegetation loss, noise, and wildlife disturbance and displacement;
- Drill rig installation and drilling, which will create noise and air emissions and related disturbance of wildlife and require water abstraction; and
- Exploratory testing, which will create noise and air emissions.

The decommissioning phase will create additional human activity and disturbance at the sites, but these effects will be *Negligible* since wildlife use of the sites and immediate vicinity will be very limited following drilling and testing due to the noise from the activities. This phase will ultimately result in cessation of Project activities and restoration of pre-Project conditions.

7.3.2 Impact Discussion

Based on the proposed Project activities outlined in Chapter 1, Description of the Proposed Project, Table Table 7-23 provides a summary of the potential sources of direct and indirect Project impacts on terrestrial biological resources.

Table 7-23: Summary of Potential Project Impacts on Terrestrial Biological Resources

Impact Type	Project Activities
Direct	■ Ground works for Project infrastructure and temporary laydown areas will result in the direct loss and disturbance of vegetation, wildlife habitat, injury and mortality to flora and fauna ■ Vegetation clearance may introduce or spread invasive and exotic plant species within the Project Area. ■ The use of heavy machinery and increased vehicular traffic along access roads could result in direct mortality or injury of wildlife species, during construction and operations. ■ The use of heavy machinery during construction and well drilling may generate localized vibrations sufficient to harm ground-dwelling terrestrial biota. ■ The installation of a permanent brine pond to hold geothermal fluids before injection may cause injury or mortality to terrestrial wildlife. ■ Project-related vehicular traffic may cause vehicular-related wildlife mortality or injury. ■ Operation of the drill rig and steam blow testing will create noise, causing wildlife displacement from the drill sites and the surrounding vicinity, which will modify wildlife use of the affected area and temporarily fragment habitat. ■ Operation of air condensers will create noise, causing wildlife displacement from the Project plant and the surrounding vicinity, which will modify wildlife use of the affected area. ■ Unforeseen accidents, such as a geothermal well blowout will cause noise disturbance and possible mortality and injury to vegetation and wildlife. ■ Worker harassment may cause disturbance, injury and mortality to flora and fauna.

Impact Type	Project Activities
Indirect	■ Project-related vehicular traffic and site preparation activities may create dust, the accumulation of which can inhibit vegetative growth. ■ Operation of the drill rig and related drilling and testing activities will generate air emissions, the accumulation of which could inhibit growth of vegetation or adversely affect susceptible wildlife resources. ■ During Construction and Operations, the Project will create artificial night-time lighting that could cause disturbance to natural cycles, feeding behaviours and migration patterns of birds, bats and other terrestrial wildlife. ■ Equipment from foreign countries may introduce invasive insect pests that could cause disturbance to natural vegetation species. ■ Project-related influx of workers in the area could indirectly increase hunting, bird poaching, and harvesting for the production of charcoal. ■ Project-related activities will indirectly result in the temporary degradation of habitat quality within the nearby sensitive area of Nevis Peak, located northwest to the Project Area.

7.3.3 Overview of Key Biodiversity Impacts and Mitigation Measures

The most significant Project impacts on terrestrial biodiversity will occur during the construction phase, which includes onsite vegetation clearing, an increase in noise and vibrations, the potential to injure or kill wildlife species, and the potential for harassment of flora/fauna by the construction/operation employees. During operations, the most significant Project impact to flora and fauna biodiversity is an unlikely scenario of a well blowout, which will cause additional direct impacts of disturbance, injury and/or mortality of terrestrial wildlife species. Artificial light is the most significant indirect impact on terrestrial wildlife throughout construction and operations. The following sections detail the potential adverse impacts to biodiversity receptors described above.

7.3.3.1 Vegetation clearing (Exploitation)

At the time of writing this impact assessment, most of the the 5-acre Project Area Project area has already been cleared; however, if any additional clearance is necessary (for pipelines and/or transmission lines), the following considerations will be taken into account. Therefore, any further vegetation clearing would only occur during a later exploitation stage.

Any rare and/or endemic plants that occur within the Project Area will be removed or subject to damage from ground disturbing activities and/or by the accumulation of dust. Wildlife that is unable to flee from the sites, during vegetation clearing activities, particularly sessile species, could be injured or killed. Vegetation clearing could impact frogs and small reptiles that may have limited mobility compared to larger fauna. Three reptile species, which are endemic and restricted range to Nevis and the nearby Islands, could be impacted with the loss of characteristic habitat, of which include St. Christopher Ameiva (NT), Statia Bank Tree Anole (LC), and the Leeward Blindsnake (NT, IUCN 2020). Baseline surveys in 2017 did not record the occurrence of these species in the Project area, however, suitable habitat characteristics occur within the Project Area and BAOI, as these species tend to inhabit semi-natural modified forest and scrub habitat

(see Chapter 5 Biotic Baseline). While impacts to these species from Project-related activities are possible, they are not likely to have substantial population level effects as their occurrence has yet to be confirmed within Project site. The population status of these species are unknown, however, any impacts to individuals have the potential to have localized subpopulation effects. Additionally, any bird nests or bat roosts that occur within the Project Area will be subject to damage from ground disturbing activities and/or by the disturbance from tree felling. The endemic Lesser Antillean Bullfinch and the Antillean Fruit-eating Bat inhabit and forage in the Project area, both of which are listed as LC according to IUCN (2020). These species will be particularly susceptible if vegetation-clearing activities occur during breeding season from April to August. Based on the receptor sensitivity and the magnitude of the impact, the pre-mitigation significance rating of this impact is *Moderate*.

7.3.3.2 Noise Impacts (Exploration and Exploitation)

Of all the impact sources generated by the Project, noise generated during construction drilling, steam blow testing activities, and general operations of heavy machinery for vegetation clearance, grading, and installation of infrastructure has the greatest potential to adversely impact wildlife. Noise impacts have the greatest potential of impact due to its magnitude and duration, which will occur for at least one reproductive cycle for fauna. Construction activities are expected to occur over an 18-month period, proceeding in phases. Well drilling and testing activities will last for more than 80 days for the eastern well pad, and an additional 40 days from drilling of the injection well. The noise generated during geothermal construction may be as high as 100-110 dB at the source (Bayer *et al.* 2013). According to the 2017 EIA, the noise level for well drilling with mud will generate a noise level of approximately 66 dBA at a distance of about 150 m from the source (Addendum EIA 2020, Section 4.4.4 Noise). Blow vent testing, required to clean out the vents, will last a day or two with the highest sound levels produced for the initial clean out lasting only a few hours. This noise level is estimated to reach 91 dB at a distance of 150 m from the source (PIA, EIA section 4.8.2, 2017). The noise generated by drilling and vent testing is expected to be high (greater than 75 dB) in areas adjacent to the drill pads and injection pad sites. However, with the maintenance of vegetation barriers surrounding the Project and the attenuation of noise by the natural forest in the BAOI, noise levels will dissipate rapidly towards small to negligible levels (45 dB or less) at distances less than 600 m. Construction of the transmission intertie line will use heavy machinery producing noise levels of 55 to 62 dBA, but will be very short in duration, lasting a few days at each point along the transmission intertie route (PIA, EIA 2017, Section 4.8.2)

It is expected that the noise generated by the Project during drilling and well testing will displace birds, bats and other wildlife from areas where noise is well above current ambient conditions. Displacement can cause affected individuals to lose access to forage, access to mates, or dependent young. It will also increase intra- and inter-specific competition in areas to which displaced individuals move. Birds are considered to be more susceptible to noise than other terrestrial taxa, as they rely heavily on acoustic communication which occurs at about 60 dB (Dooling and Popper 2015). Therefore, construction noise will mask bird calls and likely cause displacement within the vicinity of the Project well pads. The highest levels of noise, which will be experienced very close to the well and injection pads, could cause nest abandonment by birds if noise-producing activities are initiated after the onset of the breeding season, which occurs from late April to August for many species on Nevis (Steadman *et al.* 1997). If the disturbance occurs early in the breeding season, individuals could reattempt to nest elsewhere if suitable habitat exists and it is not already occupied by other individuals. However, this disturbance can cause reduced adult and young survivorship, reduced reproductive rates, or reduced offspring survivorship.

Bats may or may not be responsive to project noise depending on the amplitude and spectra of the noise; however, bats are known to abandon roosts in caves, mines, and some buildings when directly disturbed

by human activities. Little research is available to detail how bats respond to induced anthropogenic noise. Studies of other species with similar hearing apparatus (e.g., mice) suggest that chronic loud noise can potentially lead to high levels of stress, and sudden extremely loud noise can result in auditory system damage and hearing loss. Noise can also potentially mask bat echolocation signals and important acoustic communication signals and other biologically relevant sounds, such as those made by approaching predators (West, 2016). The high levels of noise produced during drilling and venting may cause roost abandonment potentially reducing survivorship of adults and young. If noise-producing activities occur within mid-April to August maternity colonies roosting in the area may abandon their roosts causing a significant reduction in offspring survivorship.

The affected area is relatively small in proportion to available natural habitat for birds and bats, but individuals that are displaced could lose a full recruitment year if the disturbance causes them to abandon nests or roosts causing reduced infant survivorship for that season. Therefore based on a medium receptor sensitivity for terrestrial fauna and rare and endemic fauna and the magnitude of the impact, the pre-mitigation significance rating of this impact is *Moderate*.

7.3.3.3 Vibrations (Exploration and Exploitation)

During drilling, localized vibrations may cause disturbance, displacement and the modification of the behavior and movement patterns of certain wildlife species. Well drilling will occur for up to 80 days in three different areas for the well pads and injection pad (see Physical baseline, Section 5.2.3). Little research is available of the effects on wildlife due to induced anthropogenic ground vibrations as opposed to air vibrations or noise, which is commonly used by wildlife for communication, as previously discussed. However, many herpetofauna use vibrations and tactile stimulation to detect predators, for example, snakes are particularly sensitive to surface vibrations. The Project drilling may adversely impact the five endemic herpetofauna within the project area by reducing predator detection, increasing stress levels, and disrupting cues necessary for orientation, navigation, and mating (Andrews et al 2006). This adverse impact will occur 24 hours per day for a medium term duration, within a relatively small area of impact. However, populations in the area that are displaced or disturbed could experience reduced survivorship for that season. Based on the receptor sensitivity of medium and the magnitude of the impact, the pre-mitigation significance rating of this impact is *Moderate*.

7.3.3.4 Worker Harassment (Exploration and Exploitation)

This impact could take place at either stage of the project, so it is relevant both exploration and exploitation. During the construction and operation phases, disturbance to endemic flora and fauna due to harassment or harm from workers is possible. Harassment can take the form of harvesting, hunting and poaching, or intentional harassment. Harassment from workers can lead to displacement, injury, and mortality to birds, and other endemic fauna. Harvesting fish and marine invertebrates is traditional (though not applicable to this Project); however, harvesting of terrestrial wildlife is less common on Nevis and St. Kitts. The international trade of tropical birds has exploited natural population stocks causing negative impacts to endemic and endangered avian populations, while Nevis is an exporter of Psittaciformes, the family of Parrots, the trade is <100 per year. Within the Caribbean region, Island countries are low-volume importers (<1000) and insignificant exporters of the wild bird trade (FAO, 2011). This adverse impact can have an impact within the surrounding vicinity of the Project and within the BAOI. Wildlife could be injured, displaced or poached, causing increased mortality and a possible reduction of genetic diversity of the wild population. Therefore, based on a medium receptor sensitivity for terrestrial fauna and rare and endemic fauna and flora and the magnitude of the impact, the pre- mitigation significance rating of this impact is *Moderate*.

7.3.3.5 Well Blowout (Exploration and Exploitation)

This impact could take place at either stage of the project, so it is relevant both exploration and exploitation. A geothermal well blowout is an unexpected, sudden release of steam and hot water from a geothermal well into the atmosphere. Well blowouts occur when the pressure in the formation exceeds the pressure well mud, casing, or valve exerts upon it. Blowouts are dangerous and can release hot and hazardous geothermal fluids, make noise, damage natural vegetation, and cause injury wildlife, causing major environmental problems (i.e., cause resource waste, develop unfavorable public perceptions of geothermal activity, etc.; R. A. Patterson & Associates, 1994). However, the probability of a blowout is considered a rare event. If a blowout occurs, wildlife and vegetation within the adjacent area will be displaced, injured or killed. Therefore, based on a medium receptor sensitivity for rare and endemic fauna and flora and the magnitude of the impact, the pre-mitigation significance rating of this impact is *Moderate*.

7.3.3.6 Artificial Light (Exploration and Exploitation)

The Project Area is naturally dark and has few artificial light sources from nearby houses and a local restaurant so introduction of light as a result of the Project will disturb and possibly temporarily displace light-sensitive species at and in the immediate vicinity of the pad sites. Nevis supports six bat species, two of which have been recorded within the Project Area; however, all Nevis' bat species are LC according to the IUCN (2020. Additionally, Nevis is a stopover for the winter migration for many birds heading north. One endemic bird (*L. noctis*) and one bat (*B. cavernarum*) inhabit and forage within the Project area and may be impacted indirectly by the artificial light. Artificial lighting can have significant impacts on bats and night-migrating birds because the lights can cause confounded navigation, changes in inter- and intra-specific competitive interactions, altered predator-prey relations, and various effects on animal physiology (Gaston et al. 2013). Introducing artificial lighting into an area with minimal or no artificial lighting can have significant impacts on bats and night-migrating birds because they act as attractants. Birds and bats can collide with lighting structures and lights can confuse migrating species, particularly when there is low cloud cover or otherwise obscured view of the night sky that birds use to navigate during nocturnal migration (Rich and Longcore 2006). Under adverse weather conditions, artificial lights can attract birds and create the "trapping effect" phenomenon, during which birds will fly around artificial lights for extended periods expending necessary energy for long distance migration and increasing chances of predation (Deda et al 2007). The Project will use artificial night lighting throughout construction and during operation activities. Night lighting can potentially impact migrating birds by increasing mortality and alter feeding behaviors of bats as well as possibly increasing predation event. Based on the medium receptor sensitivity for terrestrial fauna and the magnitude of the impact, the pre-mitigation significance rating of this impact is *Major*.

7.3.3.7 Mitigation Measures

Mitigation measures to minimize impacts on terrestrial biodiversity will include*:*

- Minimize the Project footprint to the maximum extent feasible;
- Avoid removal of trees and maintain vegetation barriers along north, south and eastern borders, where possible;
- Restore and revegetate temporary laydown areas for wildlife habitat;
- Conduct pre-clearing surveys prior to site preparation activities to flush wildlife from the activity areas and Rescue and relocate sessile species to undisturbed sites;

- Conduct bat roost surveys to scare away prior to site preparation activities by implementing humane physical or acoustic exclusion measures to keep bats away from site;
- Design and implement a Wildlife Management education training;
- Implement Worker Health and Safety Management Plan that strictly prohibits hunting and harassment of wildlife on Project site and vicinity and install no disturbance, no hunting or harassment of wildlife signs in work areas;
- Implement the noise reduction measures defined in Section 5.2.3, as well as, install temporary sound barriers, if construction is not during hurricane season, and silencers on vehicles and heavy equipment;
- Avoid drilling and steam blow testing, as feasible, between April and August to avoid impacts on bat maternity colonies and bird breeding season;
- Assess the need of a shock absorber, or damper during drilling of the well pads and injection pad to reduce ground vibration;
- Minimize the amount of artificial lighting used at the pad sites, install directional lighting (downward facing lighting) and direction accessories, and avoid the use of UV light; and
- Implement the Implement the emergency Well Blowout Prevention Plan and emergency shut-in plan to stop a well blowout, contain, and clean up any fluids that may be released. Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards.

Residual Impact Significance

Implementation of these measures will reduce the vegetation clearing, noise, vibration, possible well blowout, and artificial light impacts of the Project on terrestrial biodiversity receptors to *Minor*. Implementation of these measures will reduce worker harassment and all other impacts to *Negligible*.

7.3.4 Biodiversity Impact Summary

The Table below summarizes unmitigated and residual Project impacts to biodiversity receptors.

Table 7-24: Summary of Impacts to Biodiversity Receptors

Receptor	Impact	Sensitivity	Magnitude	Pre- mitigation Impact Significance	Mitigation Measures	Residual Impact Significance
Terrestrial Vegetation	*Direct*: Ground works will result in the direct loss and disturbance of vegetation and secondary natural forest within the road improvement/ expansion locations, exploration well pads, injection pads and immediate surrounding areas (total 5 acres or 2 ha).	Medium	Small	Minor	■ Minimize Project footprint to the maximum extent feasible ■ Avoid removal of trees where possible ■ Maintain vegetation barriers along north, south and eastern borders as feasible	Negligible
	Direct: Ground works will result in the temporary loss and disturbance of vegetation and wildlife habitat within temporary construction laydown areas (2.2 acres or 0.89 ha)	Medium	Small	Minor	■ Minimize temporary construction impacts to the maximum extent possible ■ Avoid removal of trees where possible ■ Restore and revegetate temporary laydown areas post construction	Negligible
	Direct: Ground works and Project-related vehicle traffic and equipment brought from foreign countries may introduce or spread invasive and exotic plant species	Low	Small	Negligible	■ Regular washing of Project related vehicles ■ Inspection of all equipment with arrival of overseas equipment. ■ Revegetation and restoration of temporary laydown areas with native and endemic species	Negligible
	Indirect: Equipment from foreign countries may introduce invasive insect pests that could cause disturbance to natural vegetation species in the BAOI	Low	Small	Negligible	■ Inspection of all equipment with arrival of overseas equipment ■ Follow Nevis pest mitigation and suppression regulations	Negligible
	Indirect: Project-related vehicular traffic and site preparation activities may create dust, the accumulation of which can inhibit vegetative growth.	Low	Small	Negligible	Implement dust control procedures (e.g., watering) when needed to control dust.	Negligible
	Direct: Unforeseen accidents, such as a geothermal well blowout, will cause disturbance and mortality of nearby vegetation	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency Well Blowout Prevention Plan and Emergency shut-in plan to contain and	Negligible

					clean up any fluids that may be released ■ Restore and revegetate affected areas after accident	
	Indirect: Operation of the drill rig and related drilling and testing activities will generate air emissions, the accumulation of which could inhibit growth of vegetation	Negligible	Negligible	Negligible	■ Monitor air quality to meet IFC EHS standards ■ Implement air quality management plan	Negligible
	Indirect: Project-related influx of workers in the area could indirectly increase harvesting for the production of charcoal or increase domesticated animal grazing.	Low	Small	Negligible	■ Design and implement a Community Wildlife Management education training	Negligible
Terrestrial Wildlife	*Direct*: Habitat loss for wildlife due to construction within the road improvement/ expansion locations, exploration well pads, injection pads and immediate surrounding areas (total 5 acres or 2 ha), as well as temporary laydown areas (2.2 acres or 0.89 ha).	Medium	Small	Minor	■ Minimize Project footprint to the maximum extent feasible. ■ Avoid removal of trees where possible ■ Maintain vegetation barriers along north, south and eastern borders as feasible ■ Restore and revegetate temporary laydown areas for wildlife habitat	Negligible
	Direct: Vegetation clearing and construction may result in disturbance, injury, or mortality for wildlife within the Project Area	High	Medium	Moderate	■ Conduct pre-clearing surveys prior to site preparation activities ■ Conduct bat roost surveys to scare away prior to site preparation activities by implementing humane physical or acoustic exclusion measures to keep bats away from site ■ Rescue and relocate sessile species to undisturbed sites	Negligible
	Direct: During Construction, the use of heavy machinery and increased vehicular traffic along access roads could result in direct mortality or injury of wildlife occurring within the Project Area.	Low	Small	Minor	■ Conduct pre-clearing surveys prior to site preparation activities to flush wildlife from the activity areas and ■ Relocate sessile species to undisturbed sites ■ Assess areas of wildlife crossing and install road signs	Negligible
	Direct: During Operations, Increased vehicular traffic along roads could result in direct mortality or injury of wildlife occurring within the Project Area.	Low	Small	Minor	■ Implement a Worker Health and Safety Management Plan which includes strict enforcement of speed limits and limit nighttime driving ■ Assess areas of frequent wildlife crossing and install road signs	Negligible

	Indirect: Operation of the drill rig and related drilling and testing activities will generate air emissions, the accumulation of which could adversely affect susceptible wildlife.	Negligible	Negligible	Negligible	■ Monitor air quality to meet IFC EHS standards ■ Implement air quality management plan	Negligible
	Direct: Harassment by Workers during construction and operations to wildlife causing disturbance, mortality and injury within the BAOI	High	Large	Moderate	■ Design and implement a worker Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife on Project site and vicinity ■ Installation of no disturbance, no hunting or harassment of wildlife signs in work areas ■ Installation of informative signs of biodiversity	Negligible
	Direct: The use of heavy machinery during construction and well drilling may generate localized vibrations sufficient to harm ground-dwelling terrestrial wildlife.	High	Medium	Moderate	■ Implement pre-construction surveys to relocate ground dwelling wildlife from the activity sites to the extent practicable. ■ Assess the need of a shock absorber, or damper on the drill	Minor
	Direct: During construction of the drill rig, blow testing, and other construction activities, the Project will generate high noise levels causing wildlife displacement and mask acoustic calling, thus affecting mating and feeding behaviors, within the BAOI	High	Medium	Moderate	■ Implement the noise reduction measures defined in Section 5.2.3. ■ Install temporary sound barriers, if construction is not during hurricane season ■ Maintain vegetation barriers surrounding Project Area ■ Install silencers to vehicles and heavy equipment ■ Survey areas for existing bat roosts and implement humane physical or acoustic exclusion measures to keep bats away from site ■ Avoid drilling and steam blow testing, as feasible, between April and August to avoid impacts on maternity colonies of bats, and bird breeding season ■ Construction of an earthen berm to help mitigate sound	Minor

	Direct: During operations the Project will create high noise levels from air condensers and generators causing wildlife displacement and mask acoustic calling, thus affecting mating and feeding behaviors, within the BAOI	Low	Small	Minor	■ Implement the noise reduction measures defined in Section 5.2.3 ■ Provide regular maintenance to vehicles ■ Maintain vegetation barriers surrounding Project Area ■ Construction of an earthen berm to help mitigate sound	Negligible
	Indirect: Construction and Operations will introduce artificial night lighting which could act as attractants for night-migrating or nocturnal species, increasing the potential for collision with lighting structures, increased energy expenditure, or increased predation,	Medium	Large	Major	■ Minimize the amount of artificial lighting used at the pad sites ■ Use directional lighting (downward facing lighting) and direction accessories ■ Avoid the use of UV light	Minor
	Direct: Installation of a permanent 5,000 m^3 brine pond occupying 0.9 acres (1.75 m deep) to hold geothermal fluids may cause injury or mortality to terrestrial wildlife	Low	Small	Minor	■ Installation of screen or nets over the brine collection pond to prevent wildlife contact with fluids	Negligible
	Indirect: Project-related influx of workers in the area could indirectly increase hunting and bird poaching pressure	Low	Small	Minor	■ Design and implement a Community Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife within Project vicinity	Negligible
	Direct: Unforeseen accidents, such as a geothermal well blowout, will cause disturbance and degradation to habitat, and injury and mortality of nearby wildlife	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency shut-in plan to stop a well blowout and contain and clean up any fluids that may be released ■ Install fences around immediate Project well pads	Minor
Rare and Endemic Species	*Direct*: Construction of Project Infrastructure will result in habitat loss for rare and endemic flora and fauna within the Project Areas (total 5 acres or 2 ha), as well as temporary laydown areas (2.2 acres or 0.89 ha).	Medium	Small	Minor	■ Minimize Project footprint to the maximum extent feasible. ■ Avoid removal of trees where possible ■ Restore and revegetate temporary laydown areas for wildlife habitat	Negligible

	Direct: Vegetation clearing and construction may result in disturbance, injury or mortality for rare and endemic flora and fauna within the Project Area	High	Medium	Moderate	■ Conduct pre-clearing surveys prior to site preparation activities ■ Rescue and relocate sessile rare and endemic fauna and flora to undisturbed sites	Negligible
	Indirect: Project-related vehicular traffic and site preparation activities may create dust, which can inhibit rare and endemic plants	Low	Small	Minor	Implement dust control procedures (e.g., watering) when needed to control	Negligible
	Direct: The use of heavy machinery during construction and well drilling may generate localized vibrations sufficient to harm ground-dwelling rare and endemic terrestrial fauna	High	Medium	Moderate	■ Implement pre-construction surveys to relocate ground dwelling wildlife from the activity sites to the extent practicable. ■ Assess the need of a shock absorber, or damper	Minor
	Direct: During construction and operations of the drill rig and blow testing will create noise (see Section 5.2.3), causing displacement of rare and endemic fauna from the Project Area and BAOI, which will modify wildlife use of the affected area. .	High	Medium	Moderate	■ Implement the noise mitigation measures defined in Section 5.2.3. ■ Maintain vegetation barrier around Project Areas ■ Install Sound barriers during construction if not within hurricane season	Minor
	Direct: During operations, the Project will create noise-causing displacement and mask acoustic communication of rare and endemic fauna.	Medium	Small	Minor	■ Implement the noise mitigation measures defined in Section 5.2.3. ■ Maintain vegetation barrier around Project Areas	Negligible
	Indirect: Artificial lighting will create disturbance and displacement of light-sensitive rare and endemic animal species and lights could act as attractants for night-migrating or nocturnal species, increasing the potential for collision with lighting structures, increased energy expenditure, or increased predation	Medium	Large	Major	■ Minimize the amount of artificial lighting used at the pad sites ■ Use directional lighting (downward facing lighting) and direction accessories ■ Avoid the use of UV light	Minor
	Direct: Harassment by Workers during construction and operations to wildlife causing disturbance, mortality and injury within the BAOI	Medium	Large	Moderate	■ Design and implement a worker Wildlife Management education plan ■ Implement Worker Health and Safety plan which prohibits wildlife hunting activities, poaching, or any form of harassment	Negligible

					■ Installation of no disturbance, no hunting or harassment of wildlife signs in work areas ■ Installation of informative signs of biodiversity	
	Direct: Unforeseen incident, such as a geothermal well blowout, will cause disturbance, injury and mortality of nearby rare and endemic fauna and flora	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency Well Blowout Prevention Plan and Emergency shut-in plan to contain and clean up any fluids that may be released ■ Install fences around immediate Project well pads	Minor
Protected Areas	*Indirect*: Project-related activities will result in the temporary degradation of habitat quality within the nearby Nevis Peak.	Low	Small	Negligible	■ Implement the noise mitigation measures defined in Section 5.2.3 and the lighting ■ Implement Waste Management plan ■ Implement the emergency Well Blowout Prevention Plan; and ■ Design and implement a worker Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife within Project vicinity	Negligible

7.4 Socioeconomic Impact Assessment

This section identifies and assesses the potential Project impacts on the existing socioeconomic environment and community health (including community safety and security). Information within Chapter 4, Project Description, and Chapter 5, Socioeconomic Baseline, was used to assist the evaluation of the potential impacts and their significance. This section has also considered information from other impact assessment sections of this document, in order to inform and evidence the subsequent assessment of impacts on socioeconomic and community health receptors, including but not limited to landscape and visual, cultural heritage, and traffic. These sections are cross-referenced where appropriate.

The methodologies specific to socioeconomics and community health presented in this section build upon the general assessment methodology summarized in Section 7.1, *General Methodology*. The general methodology has been tailored to the specific socioeconomic and community health-related impacts arising from Project activities. The social and community health receptors as well as Project activities relevant to this assessment are summarized below. The criteria for the assessment, magnitude, and receptor sensitivity are defined in Table 7-25, Table 7-26, and Table 7-27.

It is important to note that stakeholder engagement is a critical component to socioeconomic and community health impact assessments. The information obtained from stakeholders which is presented in the Project's Stakeholder Engagement Plan (and summarized in Chapter 6, *Stakeholder Consultation and Disclosure*), as well as information received from stakeholders during the June 2020 interviews, has informed the vulnerability and magnitude designations for this impact assessment.

Project Activities and Receptors

As discussed in the Project Description (see Chapter 4), the geothermal exploration activities include:

- Transportation activities, which could generate increased traffic and congestion on roads, noise disturbance and influx;
- Drill activities: mobilization of equipment drilling, and well testing, causing noise disturbance.
- Operation of the facility, which will generate noise disturbance, visual impacts and might release Sulphur, causing smells in the surrounding area. Operation of the facility might will also generate potential economic benefits to local communities; and
- Decommissioning, which will generate increased traffic and congestion on roads.

There are two broad categories of potential receptors with respect to potential socioeconomic and community health impacts of the Project. These categories are Project-Affected Communities and Other Affected Stakeholders.

Project-Affected Communities include:

- Residents and landowners near the Project Footprint;
- Populations in the nearest settlements to the Project area, including Charlestown; and
- Existing businesses in the nearest settlements to the Project area (e.g., restaurants, hotels).

Other Affected Stakeholders include:

- People living and working along the Project Footprint / Project's transportation routes;
- Existing potential workforce (those seeking employment);
- Vulnerable groups (e.g., children, women, elderly, disabled); and

- Local and foreign tourists at Hamilton Estate Plantation.

Receptors and resources may vary by the type of impact, and different impacts may affect different receptors. A receptor may be an individual, household, group or organization, or a community. Receptors may be affected by changes in the environment, or by changes to aspects such as land use, transportation, livelihoods, incomes, community values, or the enjoyment of natural areas. Accordingly, receptors that could experience a socioeconomic or community health impact in one or more of these ways because of Project activities are identified and assessed in this section.

7.4.1 Methodology

In this assessment, sensitivity (vulnerability) represents a stakeholder's resilience or capacity to cope with change. There is a range of variables that can influence a stakeholder's sensitivity and will be considered (e.g., age, gender, land rights, employment, livelihood strategies, education). When considering impacts on people, sensitivity is typically a complex interaction of some or all such factors. In order to facilitate a comparison of impacts for the purposes of this ESIA, a series of criteria attempting to capture these elements have been established based on professional judgement and Good International Industry Practice (GIIP).

Also aligned with GIIP, the community health assessment looks at the four "determinants of health" themes:

- Individual (e.g., lifestyle, circumstance);
- Social (e.g., conduct of workforce, spread of disease);
- Environmental factors (e.g., noise impacts from equipment, impacts on road safety due to increased traffic); and
- Institutional factors (e.g., quality and quantity of local health and emergency service).

It is important to note that for socioeconomic and community health impacts, the concept of sensitivity (vulnerability) is a key consideration and reflects the degree of response to a change in baseline conditions by a receptor. This degree of response may range from being very susceptible to change (and having little resilience) to being able to absorb or adapt to change (being very resilient). In many cases, certain subgroups (for example, children, women, the elderly, and disabled peoples) may be disproportionately affected. Therefore, vulnerable groups as a receptor category have been assessed separately.

The table below outlines the criteria for evaluating sensitivity from *Low* to *High*. The sensitivity of receptors is considered in the context of each individual impact.

Table 7-25: Description of Sensitivity (Vulnerability) Designation for Social and Health Receptors

Sensitivity	Description
Low	■ Minimal vulnerability; consequently with a high ability to adapt to changes brought by the Project and opportunities associated with it; ■ Communities with sufficient coping strategies who feel little or no challenge to their wellbeing as a result of project activities; and,

Sensitivity	Description
	■ They may share resources with the project occasionally and broadly understand the hazards associated with project components.
Medium	■ Some, but few areas of vulnerability; retain an ability to at least in part adapt to change brought by the Project and opportunities associated with it; ■ They are likely to experience temporary inconvenience as a result of changes in environmental or social determinants of health; they express some concerns and anxieties regarding the impact of the Project on their wellbeing; and, ■ They have some, but not complete, understanding of the technical hazards associated with project components.
High	■ Profound or multiple levels of vulnerability that undermine the ability to adapt to changes brought by the Project and opportunities associated with it and very limited coping strategies; ■ Groups who are very young, very old, or disabled may have high sensitivity to changes in environmental health determinants, such as air quality and noise levels; ■ Groups who are poorer or who have lower social status have high sensitivity to changes in social health determinants because they have less access to medical care, complaint procedures; or political representatives; and ■ They may be marginalized.

Source: ERM, 2020

The magnitude of an impact is a measure of the degree of change in the baseline environment as a result of the Project. This baseline could refer to a diverse range of factors affecting individual receptors (i.e., financial, physical, or emotional). The dimensions affecting magnitude include the duration, frequency, reversibility, and extent of an impact. The determination of impact magnitude for adverse impacts is also based on a scale of *Negligible* to *Large*.

Table 7-26: Description of Magnitude Designation for Social and Health Receptors

Magnitude	Characteristics
Negligible	Change remains within the range commonly experienced within the household or community
Small	Perceptible difference from baseline conditions; Tendency is that impact is local, rare, and affects a small proportion of households and is of a short duration
Medium	Clearly evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional and impact may be regional in scale.

Magnitude	Characteristics
Large	Change dominates over baseline conditions. Affects the majority of the area or population in the Area of Influence and/or persists over many years. The impact may be experienced over a regional or national area.
Positive	In the case of positive impacts, it is generally recommended that no magnitude be assigned unless there is ample data to support a more robust characterization. It is usually sufficient to indicate that the Project will result in a positive impact, without characterizing the exact degree of positive change likely to occur.

Source: ERM, 2020

Table 7-27: Designating Significance Ratings for Social and Community Health Impacts

Impact Significance Matrix		Sensitivity / Vulnerability / Importance of Resource/Receptor		
		Low	**Medium**	**High**
Negative Impacts				
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major
Positive Impacts				
Magnitude of Impact	N/A	Positive	Positive	Positive

Source: ERM, 2020

A range of potential impacts have been scoped out on the basis that the impacts will be Negligible and, therefore, further mitigations are not required. These are described in Table 7-28 and Table 7-29.

Table 7-28: Scoped Out Social Impacts

Impact	Reason for Scoping Out
Reduced availability for grazing land	It is common for donkeys to graze around the Project area. These donkeys are wild, so this is not expected to adversely affect social receptors in any significant way by Project activities.
Impacts to Indigenous Peoples	There are no Indigenous Peoples in the Project Area of Influence
Physical Resettlement	The project will not cause physical or economic displacement. Project site is located on lands leased by NREI from NIA and the underground transmission line will use the existing right of way of the road.
Economic Resettlement	As stated above, the project will not cause livelihood impacts or cause economic displacement. The Project area is vacant land and the nearest business is located 0.5 km from the site.
Influx of Workers	Peak employment will be 75 workers, and the Project will attempt to hire locally. Charlestown has a population of 2,200, thus the workforce will not stress local infrastructure, as it is a small percentage compared to Charlestown's population, and hiring locally will be prioritized, leading to a significantly reduced influx of workers.

Source: ERM, 2020

Table 7-29: Scoped Out Community Health, Safety and Security Impacts

Impact	Reason for Scoping Out
Stress on local medical facilities	Since peak employment during drilling activities will be 75 people, it is not expected to add significant stress on existing medical facilities.

Source: ERM, 2020

The Project is not considered high risk from a socioeconomic standpoint and there are no significant socioeconomic triggers that will necessitate a separate Human Rights Impact Assessment. With regards to the potential risks for Human Rights, there were no significant adverse potential impacts identified that will not be mitigated through adherence to existing policies, plans and procedures, as well as through community engagement and implementation of the community grievance mechanism.

It has been assumed that the consideration of the potential health and safety impacts to the Project's workforce will be taken care of through the Project's Occupational Health and Safety standards and guidelines, which the Drilling Contractor will be required to comply. This is also the case for Emergency and Disaster Response.

Traffic Impact Assessment Methodology

The significance of marine and road transportation impacts are determined by comparing the level of receptor sensitivity against the magnitude of the impacts themselves. The tables below summarize receptor sensitivity for traffic and transportation, and the definitions for traffic and transportation impacts. Table 7-2 in Section 7.1 provides the impact matrix used to determine significance.

As described in Section 5.2.5.5, Road Infrastructure, minimal quantitative data (such as road or marine traffic counts or crash data) are available for Nevis or the Project Area. As a result, the description of traffic conditions, and especially the evaluation of traffic impacts, is largely qualitative in nature.

Table 7-30: Receptor Sensitivity Designation for Traffic and Transportation

Sensitivity	Description
Low	Receptors (typically non-project drivers, cyclists, pedestrians and marine vessel operators) are readily able to adapt to Project-related changes in road or marine traffic volumes and patterns, and/or are not vulnerable to reductions in transportation safety.
Medium	Receptors can adapt to some, but not all, Project-related changes in road or marine traffic patterns and transportation safety. Some receptors (e.g., those who must walk along public roads to reach markets or schools) are especially sensitive to degraded traffic safety conditions.
High	Receptors are unable to adapt to changes in road or marine traffic patterns and transportation safety without notable threats to health and/or safety. Substantial portions of the population are isolated or otherwise vulnerable to degraded traffic safety conditions.

Table 7-31: Magnitude Designation for Traffic and Transportation

Magnitude	Description
Negligible	Changes in marine or road traffic congestion, traffic volumes, road deterioration, crashes, and/or injuries are not readily noticeable (or no change occurs).
Small	Increase in marine or road traffic congestion, traffic volumes or road deterioration that, while noticeable, does not require a change in daily travel patterns. Increase in crashes and injuries may or may not be notable.

Magnitude	Description
Medium	Notable increase in marine or road traffic congestion, traffic volumes or road deterioration requiring changes in daily travel patterns. Increase in the number and/or severity of traffic crashes and injuries, but not to the point where medical service capacity or individual livelihoods suffer notably.
High	Dramatic increase in marine or road traffic congestion, traffic volumes, or road deterioration, to the point where daily travel patterns are substantially altered. Dramatic increase in the number and/or severity of traffic crashes and injuries (including deaths), to the point where livelihoods are altered and/or the capacity of emergency response capacity is strained.

Aesthetics Impact Assessment Methodology

The significance of impacts on aesthetics are determined by comparing the level of receptor sensitivity against the magnitude of the impacts themselves. The tables below summarize receptor sensitivity for aesthetics, and the definitions for aesthetic impact magnitudes. Table 7-2 in Section 7.1 provides the impact matrix used to determine significance.

Table 7-32: Receptor Sensitivity Designation for Aesthetics

Sensitivity	Description
Low	Receptors (typically existing residents or workers) are accustomed to the presence of industrial visual elements amongst natural scenery and other non-industrial views, and/or are unlikely to perceive the addition of such features as undesirable.
Medium	Receptors (typically a mix of residents, workers, and visitors) expect minimal presence of industrial visual elements, and consider such elements (amongst natural or non-industrial scenery) to be undesirable, but not to a degree that changes typical activities.
High	Receptors (primarily visitors) expect an absence of industrial visual elements, and perceive any new industrial visual elements as substantially undesirable. The presence of industrial visual elements will cause these receptors to change their typical or planned activities.

Table 7-33: Magnitude Designation for Aesthetics

Magnitude	Description
Negligible	Changes in visual conditions are not readily noticeable (or no change occurs).
Small	Project-related industrial visual elements are perceptible, but are entirely subordinate to more natural or non-industrial views.
Medium	Project-related industrial visual elements are perceptible, and begin to dominate some views, but are still generally subordinate to natural or non-industrial views.
High	Project-related industrial visual elements are dominate some views, and are not subordinate to natural or non-industrial views.

7.4.2 Impact Discussion

Below is a discussion of the array of socioeconomic and community health, as well as, safety and security benefits and impacts expected. The impacts, along with their corresponding mitigation measures and residual impacts are set out in Table 7-34.

7.4.2.1 Economic Benefits (Exploration and Exploitation)

The primary benefits of the Project include employment generation and increased demand for goods and services.

Employment impacts arising from the construction and operations phases of the Project will include:

- Generation of direct employment by the Project; and
- Economic development created as a result of indirect employment by suppliers of goods and services to the Project.

Direct employment created during construction is considered a beneficial impact of the Project. Employment estimates provided by NREI in June 2020 consist of the following:

- Drilling - Drilling will require two 9-person crews plus NREI supervisors.
- Plant Construction
  - During erection: During peak construction periods, up to 75 workers will be at the site. NREI will hire from the local workforce, where possible, particularly during the initial stages of construction. Many of the construction activities will require workers with specialty skills who will live in local hotels and accommodations. An engineer shall be at site to record and monitor the erection, review of installation as applicable for completion of erection of the supplied Equipment.
  - Commissioning - Supplier will have one installation supervisor for 16 man/weeks, and one commissioning supervisor at site for 16 man/weeks.
- Operation - NREI estimates that it will have 17 employees on site, five operators per shift and a plant manager for two shifts. Most employees will be local or retrained workers from NEVLEC. There may be one or two operators or senior technicians during the first year of operations, but will transition to local hires with remote monitoring.

At the height of construction, approximately 75 temporary employees will be employed on-site, which will result in beneficial employment and indirect employment impacts for suppliers including goods and services providers for the Project, such as food vendors and building materials companies. The construction period will last approximately 73 weeks (approximately 18 months), commencing approximately in 2021.

It is likely that up to 75 workers will be at the site at the peak of construction and a team of 10 to 15 working on the pipeline. These workers are likely to be sourced from Nevis where possible. This total could be slightly larger at times if more locals are required to support with construction equipment in difficult locations.

The majority of employment during construction is likely to be short-term.. The unskilled and semi-skilled workforce is anticipated to generally come from the local area.

Direct Employment

The Project will have a *Moderate Positive* impact on employment during construction. The level and range of skills and applicable working experience available in the adjacent communities may be limited by education and relevant skills training. As a result, the ability to acquire a position, and successful performance once hired, will favor experienced (skilled) personnel for professional roles, the majority of whom will likely come from abroad. Therefore, operational employment opportunities are likely to be sourced from outside the local community. As the Project moves towards decommissioning and closure, there will be a subsequent decrease in the workforce requirements.

However, it must be noted that there is the potential for negative sentiment generation within the community in relation to the employment of non-local labor. Specifically, this may arise relating to:

- Unfulfilled local employment expectations and resentment between local people who are employed by the Project and those who desire jobs but have not been hired, and between local and non-local workers if local people perceive that foreign workers are receiving better pay or conditions for the same job;
- Unfulfilled skill development and training expectations as the positions to be filled by workers local to the area are likely to be unskilled/semi-skilled) and short term, and training of local workers associated with the Project – if it occurs – will be limited to the training required for these unskilled (or potentially semi-skilled) positions; and
- Increased tensions within the local communities over access to jobs and due to the presence of non-local workers in the area.

Indirect Employment

Plant staff and contractors will require various vendors, suppliers and service providers to meet the daily operating needs of the Project, and the domestic needs of its employees. This could include goods and services include food vendors, laundry, supply of vehicles and transportation services, security patrols, as well as some construction equipment.

In addition, the Project will induce secondary/tertiary economic activity due to presence of construction workers, construction worker's camp, and a few operational staff that will require some housing during operations, food, and other types of resources and services. There will be opportunities for utilizing local goods and services for the Project and related activities. Typically, 3.2-3.5 jobs in service and supply sectors are created for each direct job generated by oil and gas projects (National Petroleum Council, Macroeconomic Impacts of the Domestic Oil & Gas Industry, 2011). Assuming that oil and gas job generation is expected to be slightly higher than geothermal development, the Project may result in approximately 20-30 additional jobs. At the local and regional levels, this is likely to stimulate some minor growth for local producers, as well as induce growth in other industries such as retail, hospitality, transportation, etc. The additional jobs created indirectly will be considered a *Minor Positive* impact.

Further, worker accommodations will be located at nearby communities for a period of approximately 73 weeks where rooms and houses will be rented, which will result in the generation of additional income for local residents in the Project-Affected Communities.

The Project will create a benefit by providing support in development of essential infrastructure as well as the provision of new jobs for local residents, indirect economic development impacts, and potential opportunities for industry diversification. Women, in particular, tend to work as vendors in the tourism industry and will benefit from opportunities that bring more potential clients into the community. Per interviews conducted with the local communities in June 2020, some saw the Project as a potential tourism attraction.

Conclusions

Employment impacts are anticipated to result in approximately 100 temporary jobs (direct and indirect) during construction and up to 20 permanent jobs during operation. Given that Charlestown is made up of approximately 2,200 people, this will be considered a *Moderate Positive* impact. Opportunities could be enhanced via training and local job readiness programs. In the long-term, direct employment impacts are expected to decrease as opportunities focus more around a few skilled positions which are likely to come from outside the community. However, some *Minor Positive* indirect impacts from employment will still be

anticipated from suppliers and other businesses in the community. The potential for negative sentiment from the community related to non-local labor must be monitored and managed closely.

Enhancement Measures

In order to enhance economic benefits, it is important that the employment process is well managed and that the local community is able to actively participate to the extent feasible. Impacts to local businesses will also require rapid action to be properly addressed. The following measures will contribute to this:

- Ensure a transparent hiring process is conducted help the community to understand strategic staffing decisions for the Project.
- Develop a Workers Selection Management Plan – a commitment to maximize employment and skills opportunities for local people.
- Develop a training and skills program to impart best practice in the skilling of local people for construction jobs.
- Encourage contractors to provide apprenticeship opportunities to local people and encourage supply chain partners to recruit local people.
- Establish a local job readiness program and encourage the construction supply chain to continue to invest in workers.
- Focus a portion of community development investment on girls' and women's education and health;
- ;
- Establish a local employment brokerage that will publicize job vacancies and put in place initiatives to ensure employment opportunities for hard to reach groups.
- Ensure that tourism providers will be contacted immediately prior to the construction stages.
- Activities adjacent to local businesses will be restricted to the extent feasible.
- Ensure that any grievances raised by tourism providers or other local businesses will be managed in an appropriate and timely manner. Where corrective actions are required; they will be implemented effectively and in a timely manner. The Project will ensure that workers are aware of how and where to make complaints using the Project Grievance Mechanism.

The residual impacts after these enhancement measures will still be Moderate Positive direct impacts during construction and Minor Positive indirect impacts.

7.4.2.2 Land Use (Exploration and Exploitation)

While land use will be impacted more greatly once the Project is definitively in the exploitation stage, it is also impacted during exploration.

Power Plant

Construction and operation of the plant will require the use of land for the power plant and for the transmission line route.

- For construction of the power plant, approximately 0.1 acres of Hamilton Heritage Trust land that NIA has leased to the company, on the Hamilton Stable parcel, will be used.

Transmission Line Route

The transmission line will be underground. NEVLEC has identified the route for the underground line and is establishing the right of way for this circuit.

Alternative Sites

Several power plant sites and transmission line route options were considered as part of the Project (refer to Alternative Analysis). Multiple sites were considered for the power plant once the geothermal resource was identified. Sites in the Spring Hill area and Jessup area were evaluated, as well as looking into two different sites on the Hamilton Estate. Ultimately, the power plant site location and preferred transmission line route were chosen because it was the only location where the test well was successfully flow-tested, and where the surveys indicated the geothermal reservoir was within practical drilling depth. Further, the location minimized the surface footprint of the plant facilities and transmission line and allowed the transmission intertie connection to be buried, minimizing surface disturbance in the local area and providing greater resiliency against storm events or other potential interruptions. Lastly, the chosen Hamilton Estate location has the shortest access road from the port, minimizing traffic disturbance to the surrounding area, there are no water bodies on or near the site, and the site is unused and undeveloped.

The land where the Project will be located was not in use previously, so the impacts are expected to be *Negligible*. There were no economic activities taking place on the Project land, resulting in no economic displacement. Further, the lands were not considered to have intangible cultural heritage value.

7.4.2.3 Water Use (Exploration and Exploitation)

Similarly as was described above, water use will have an impact on both stages but it will be more important during exploration. The Project may result in increased pressure on local water use, since up to 10,000 gallons of water a day will be used for drilling, to be stored in a 65 m^3 capacity tank. There is already a problem with water availability on Nevis (See Chapter 5 Socioeconomic Baseline) so the Project's use of water might generate negative impacts on social receptors. A 4-inch water main north of the site will provide up to 250 gallons per minute to fill the drilling sump and will provide most of the water supply for drilling and plant operations. Supplemental water from the Hermitage Heights Tank Farm near Charlestown, approximately 1.6 miles west of the site, will be delivered by truck. These impacts will be considered *Moderate* prior to mitigation. For mitigation measures, see Section 0.

7.4.2.4 Tourism (Exploration and Exploitation)

The Project could affect use of the Hamilton Estate Plantation, which is a cultural heritage site, as a result of increased noise and construction activities during both the exploration and exploitation stages. As shown in Section 7.2.1.2, without mitigation measures, noise will exceed the daytime threshold (55 dBA) at the location of the Station. If not properly managed, this impact could have negative implications for the nation's tourism industry, given that one of the most popular tourist attractions is the fact that Alexander Hamilton was born on the island of Nevis.

However, it is possible that the Project might also lead to an increase in ecotourism related to renewable energy once the exploitation stage is ongoing.

Further Project impacts to tourism could result from:

- Potential roadway access restrictions during construction restricting access for visitors to the Hamilton Estate;
- Potentially adverse effects to the Hamilton Estate site or geothermal features on Nevis Peak; and
- Any potentially beneficial impacts to local tourism businesses due to increased activity during construction and operations in the Area of Influence.

Although any roadway access restrictions will be short-term, it could result in a minor reduction in local tourism business. In addition, tourism businesses such as local hotels, restaurants, and vendors will be expected to experience a minor increase in local business due to the presence of construction and operational employees. Women in particular tend to work as vendors in the tourism industry and may be disproportionately impacted by any effects on the tourist industry that will result from the Project. As such, it will be particularly important that any proposed mitigation measures specifically consider additional opportunities for women, and enhance the benefits to women of the geothermal site by offering visits and tourism opportunities that benefit women, to compensate for any potential negative impacts. For further enhancement measures related to tourism and employment, see Section 7.4.2.1.

7.4.2.5 Traffic and Transportation (Exploration and Exploitation)

The movement of Project equipment and materials to the island of Nevis, and from Long Point Port to the Project site, will result in interactions between Project-related traffic and non-Project traffic, as well as the potential for travel delays and reduced public access, especially to roads and adjacent lands near the Project site. This will be particularly true during the exploitation stage, but will also be a factor for exploration. This section evaluates the significance of those potential impacts.

The receptors for transportation and traffic impacts are individuals who use the affected portions of the island's existing transportation system, particularly marine traffic that uses Long Point Port, the roads from the port to the Project sites, and roads used by workers and local suppliers to travel to the Project site. This includes drivers, cyclists, pedestrians, and (in the case of Long Island Port) vessel operators.

The Project will generate several potential traffic and transportation impacts, as discussed below. Table 7-34 summarizes the significance of these impacts.

Impacts on Marine Traffic and Port Capacity

Project supplies and equipment will arrive at Nevis via Long Point Port. The port currently experiences moderate activity and non-existent waiting times, and thus has capacity to accommodate increased marine traffic (NASPA 2020). In 2016, Nevis received 124 dry cargo ships and 31 tanker ships; it is assumed that all of these ships called at Long Point Port, the only designated commercial port on the island (RAC-REMPEITC 2018). A laydown area for the Project will be installed near the port (NREI 2020a).

The anticipated increase in marine cargo arrivals at Long Point Port is not known. A similar project on the Island of St. Vincent anticipated receiving about 70, 12-meter shipping containers, plus a 20 to 25-meter drill rig, for exploratory drilling (ERM 2016). For the Nevis geothermal Project, drilling equipment as well as supplies and equipment for power plant and electrical transmission conduit construction will be required. Assuming relatively constant numbers of cargo vessel calls through the Project construction period, this ESIA assumes that the required shipping containers could be included as part of existing cargo calls, or could require the equivalent of a small number of additional cargo vessel calls. Based on this assumption, Project-related cargo vessel activity will not exceed Long Point Port's cargo-handling capacity. The plans to establish a Project laydown area will provide storage and staging for Project materials without affecting the Port's storage capacity. Impacts on marine traffic will therefore have a small magnitude, and no mitigation measures will be required.

Other marine traffic in the waters near Long Point Port are accustomed to the commercial shipping activity near the port and will therefore have low sensitivity to increases in the frequency of cargo ship calls. Based on the small magnitude of impacts, and low receptor sensitivity, Project construction will have negligible impacts on marine traffic and port capacity.

Project operations will result in minimal (if any) new vessel traffic, and will therefore have negligible impacts on marine traffic and port capacity.

Impacts on Road Congestion and Delays

Road traffic impacts will result from several types of Project-related travel:

- Worker commuting during construction. An estimated 120 workers will be employed during peak construction periods (NREI 2020b). The Project plans to provide buses for some workers to reduce traffic congestion (Thermal Partners 2019), although the number, capacity, routes, and trip frequency of those buses has not been specified. Distinct construction activities during the 18-month construction period include:
  - Drilling, estimated to take about 8 months, using two, 9-person crews;
  - Plant construction, estimated to take 18 months with peak workforce of 75 workers; and,
  - Conduit installation from the Project geothermal power plant to the existing power plant.
- Delivery of equipment, materials and supplies during construction. Most deliveries are anticipated to come from Long Point Port via Long Point Road, Pump Road and Hamilton Road. Some deliveries may also come from local suppliers in Charlestown or other locations on Nevis. Truck volumes are not known, but heavy equipment and large components will be needed.
- Transmission conduit installation along local roads between the new geothermal plant and the existing Prospect power plant. In some locations, trenching and conduit installation will encroach on roadways and partially impede traffic during installation of the particular segment of conduit (Thermal Partners 2019).
- Transportation by truck of supplemental water as needed for drilling and plant operations, from the Hermitage Heights Tank Farm near Charlestown, approximately 1.6 km west of the well and plant site (Section 4.4.13).
- Worker commuting and deliveries during operations. NREI estimates that it will have 17 employees on site, including five operators and a plant manager, per shift for two shifts.

The volume of workers needed, even at peak construction periods, is not anticipated to result in significant traffic congestion, although brief delays and queuing could occur at the intersection of the Project access road and Hamilton Road, as well as the 4-way intersection of Hamilton Road, Pump Road and Government Road.

During construction, truck traffic from Long Point Port is likely to result in short-term delays and congestion on Long Point Road, Pump Road and Hamilton Road due to the movement of slow-moving trucks. Congestion will be more noticeable to road users on days with multiple truck deliveries. Hamilton Road may not have sufficient width for 2-way traffic when wide loads are moving, requiring traffic moving west to be stopped while loads travel east to the Project site. Delays will be less significant if truck deliveries from the port are scheduled to move at non-peak traffic hours, such as between 10 a.m. and 2 p.m. on weekdays. Scheduling of truck deliveries on weekends could also reduce the occurrence of traffic delays, but may hinder tourism-related traffic.

The transmission conduit will follow existing roads starting at Hamilton Estates, running through Blaziers Estate and Marion Heights before reaching the Prospect Power Station via upper Stoney Grove (Figure 4.17, Section 4.4.10). Where trenching alongside the road next to existing utilities is not possible, conduits will encroach on the road, resulting in temporary traffic disruption and congestion during construction as well as when occasional repair or maintenance is needed during operations.

The following measures will be necessary to manage Project-related road congestion during construction:

- Minimize truck deliveries during morning and afternoon peak hours, as determined in accordance with Nevis traffic authorities.
- Provide and enforce a Journey Management Plan for truck deliveries that includes compliance with speed limits, safe driving practices, required use of escort vehicles for movements of cargo containers or other large equipment, and understanding of vehicle handling, community impact and response to spills or incidents.
- Provide traffic controls (flaggers) where conduit installation temporarily reduces road width. Clearly mark temporary detours, if needed.
- As proposed by the applicant, provide buses for construction worker transport.
- For oversized vehicles, coordinate with local authorities, use escort vehicles, and provide advance notification to community leaders and representatives concerning details of schedule and potential impediments to travel.
- Minimize truck trips through scheduling and development of efficient vehicle manifests.
- During operations, make continued use of Journey Management Plans for truck deliveries.

Road users will have medium sensitivity to Project-related traffic congestion and delays. Road users are accustomed to occasional traffic delays near Charlestown and will be capable of adapting to short-term, periodic traffic congestion and delays by using alternative routes and accepting minor delays.

Subject to the above-described mitigations, the magnitude of Project construction impacts on road congestion and delay will be small. In combination with medium receptor sensitivity, Project construction will have minor impacts on road congestion and delays.

Project operations will result in negligible new vehicular traffic, and will therefore have negligible impacts on road congestion and delays.

Impacts on Road Infrastructure

The heavy truck traffic required for Project construction will result in road wear and deterioration. Roads that have cracks, potholes or damaged edges can produce traffic delays and increase safety hazards. Delayed or deferred maintenance and repair of minor road surface deterioration can result in accelerated deterioration. The following mitigations can help to address damage to road infrastructure; however, full implementation will depend upon action by the Nevis Public Works Department.

- Require trailer transport of tracked vehicles.
- Conduct pre-construction inspection of the haul route between Long Point Port and the Project site.
- Monitor road conditions during construction and inspect the haul route at the conclusion of construction to identify damage that occurred during construction (regardless of the source of damage). Communicate with the Nevis Public Works Department about road maintenance and repair needs.
- Provide funding to repair road damage caused by Project activities.

Road users will have medium sensitivity to Project-related road infrastructure deterioration. Drivers will be capable of adapting to short-term defects in road surface condition by adjusting their driving speed, and could accept short-term, minor delays during road repairs. Cyclists who travel on the roadways will have greater sensitivity to the safety hazards caused by damaged road edges.

Subject to the above-described mitigations, the magnitude of Project construction impacts on road infrastructure will be medium. In combination with medium receptor sensitivity, Project construction will have moderate impacts on road infrastructure.

Project operations will result in negligible new vehicular traffic, and will therefore have negligible impacts on road infrastructure.

Impacts on Road Transportation Safety

Users of Long Point Road, Pump Road and Hamilton Road will experience an increased safety risk due to Project-related traffic, and especially from large vehicle movements. This risk will be highest for pedestrians and cyclists because there are essentially no sidewalks or pedestrian paths along the haul route roads, as well as most roads between the Project site and Charlestown.

A school is located at the four-way intersection of Long Point Road, Pump Road, and the Nevis primary ring road (called Beach Road and Main Street at this location). The combination of large Project-related vehicles, limited road width, and unprotected pedestrians could result in increased risk of injury, especially where the roads will be used by students walking to school. The measures necessary to manage Project-related transportation safety risk include the measures described above for road congestion and delay and road infrastructure, in addition to the following measures:

- Schedule truck deliveries during the middle of the day, specifically for hours when children are in school and most workers are at their place of employment.
- Engage with communities to promote awareness of road safety issues and practices. Include education on road safety for drivers and pedestrians, specifically around Project activities.
- Provide information to community leaders and organizations on scheduling and anticipated changes in traffic types and volumes due to Project construction.

Road users will have medium sensitivity to Project-related road traffic safety issues. As described in the table below, drivers can adapt to temporary increases in truck traffic, However, pedestrians and cyclists who use the public roads to reach jobs, markets or schools are especially sensitive to increased traffic safety conditions.

Subject to the above-described mitigations, the magnitude of Project construction impacts on road safety will be medium. In combination with medium receptor sensitivity, Project construction will have moderate impacts on road transportation safety.

Project operations will result in negligible new vehicular traffic, and will therefore have negligible impacts on road transportation safety.

7.4.2.6 Aesthetic Resources (Exploration and Exploitation)

Project construction and operation could introduce new visual elements to the largely natural-appearing Project site. While this is true of both stages, the exploitation stage, and the associated construction that it would entail, would encompass most of the aesthetic resources impacts described here. Activities generating changes could include clearing of vegetation from the project site (to be maintained in a cleared state for the duration of Project operations), the presence of a drill rig, vapor plumes during well testing, presence of the Project's aboveground facilities, installation of the electrical transmission conduit, and increased vehicle traffic, especially during construction. This section evaluates the significance of the visual contrast caused by these changes.

The receptors for aesthetic impacts are individuals who view the Project site, as well as individuals whose livelihoods rely, in part, on aesthetically pleasing views that currently include the Project site. This includes residents whose homes have views of the Project site, travelers on roads with views of the project site, and workers at affected tourist businesses.

The figures below show a west-facing and east-facing view from the Project site, taken during preliminary investigations. As demonstrated in these images, views of the plant site from all directions are largely screened by existing vegetation and other structures. As a result, viewers in these locations will see little if any drilling, testing, or construction activities, although portions of the 70-foot tall drill mast and steam plume during well testing could be noticeable above the vegetation. For example, a line-of-sight analysis from the upper terrace of Bananas Restaurant, approximately 350 meters west and 30 meters above the Project site, determined that the top of the drill rig could be visible through existing vegetation.

Viewers from Nevis Peak or other elevated locations with views of the southwestern portion of Nevis could also see the Project site. From this distance and elevation, the Project will comprise a relatively small portion of the visible land area, and will appear adjacent to—and difficult to distinguish from—other nearby developed areas.

Figure 7-5: View from Project Site Looking West

Figure 7-6: View from Project Site Looking East

Similarly, viewers in Charlestown and the coastal communities of St. Paul Charlestown Parish and St. Thomas Lowlands Parish will also have limited (if any) views of drilling, construction, and ongoing operation of the Project. During drilling and well-testing activities, operations may be visible from some tourist areas of Pinney's Beach, about 1.5 miles from the Project site.

Visual disturbances associated with the 1.7-mile underground transmission line will be most prominent during construction, due to disturbed ground and the presence of construction vehicles; however, these disturbances will only be visible from roads, residences, and businesses immediately adjacent to the transmission line route itself.

The following mitigations could help to avoid or reduce visual impacts:

- To the degree possible, minimize vegetative clearing within the Project site, and preserve trees at the edge of the Project boundary to provide visual screening from surrounding properties.
- To the degree possible, minimize or avoid nighttime drilling and construction to reduce impacts from nighttime construction lighting.
- Where nighttime activity is necessary, use the minimum intensity lighting necessary for safe activities, and use only "full cutoff" lighting, directed downward to avoid light spillage.

Aesthetic impacts have a substantial subjective component, reflecting each viewer's individual aesthetic preferences. While some residents and visitors may expect views with minimal evidence of human activity, others (primarily residents and workers) will be accustomed to views that include buildings, roads, vehicles, and other human activity. As a conservative measure reflecting the importance of the tourist economy on

Nevis, receptor sensitivity for aesthetics is therefore considered to be medium: views of industrial activity will be considered undesirable, but will not meaningfully change typical or planned activities.

Subject to the above-described mitigations, the magnitude of Project construction and operation impacts on aesthetics will be small, due primarily to the screening effect of vegetation and topography. In combination with medium receptor sensitivity, the Project will have minor impacts on aesthetics.

7.4.2.7 Gender Impacts (Exploration and Exploitation)

The Project will likely affect men and women differently in both stages, but particularly during exploitation. This is because the type of employment opportunities provided by the Project are more likely to be directed towards men. As has been stated above, women typically benefit from any tourism-related impacts or opportunities that the Project may result in, as they are more likely to work in the tourism sector than the construction sector. Further, as has been stated in the Gender Assessment in Chapter 5, SKN is a patriarchal society where power structures are dominated by males (BCPA Country Report). Embedded socio-cultural attitudes and behaviors perpetuate ideas and practices along patriarchal gender lines which create disadvantages that affect the life chances of women (CDB's Country Gender Assessment, 2014). Therefore, it is unlikely that women will benefit from the construction and operations-related employment opportunities that will be created by the Project, which risks creating gender-based exclusion.

Studies on gender equality in the construction sector have shown that the majority of men and women working in the construction industry get to know about job openings through friends and relatives (ILO Country Office for Pakistan, Baseline Study to Assess Gender Disparities in Construction Sector Jobs, 2011, from now on "ILO Baseline Study"). The survey shows that most women cannot avail job opportunities in the construction sector as they do not possess the necessary social connections (ILO Baseline Study). This finding highlights the need to mainstream job information for construction-related jobs, so that women can also have access to this information.

Further, women often lack relevant skills due in part to either the lack of information about training opportunities, or the actual lack of training opportunities, which means that they cannot compete in the job market with their male counterparts (ILO Baseline Study). This phenomenon ultimately leads to a situation where women are less visible (ILO Baseline Study). Prior to mitigation, gender-related impacts could be considered to be *Moderate.*

Therefore, the Project has the potential to contribute towards gender equality by mainstreaming job opportunity information and emphasizing that they are open to women applicants, so women know that they can apply. See additional mitigation measures in Workers Selection Management Plan. After these measures, gender-related impacts will be *Minor.*

7.4.2.8 Community Health, Safety and Security Impacts (Exploration and Exploitation)

Health and safety impacts arising from the construction, operations and decommissioning of the Project during both stages are likely to include the following:

- Increased risk of traffic hazards and incidents associated with Project construction routes (see Section 7.4.2.5);
- Increased noise;
- Exposure to hydrogen sulfide gas, leakage, and well blow outs;

- Major accidents associated with the storage and use of working fluid (typically n-pentane);
- Exposure to Project-related hazards associated with construction and operational activities;
- Site security issues including public access to the plant and the transmission line;
- Community health impacts related to dust emission during construction that will exacerbate existing or cause new conditions (e.g. respiratory, eye, skin diseases); and
- Community health impacts related to COVID-19.

Project activities are expected to result in noise generation in the Project Area over an extended period of time (a maximum of 120 days). Specific noise data and assessments of thresholds for receptors can be found in Chapter 5, Baselines. The sensitivity of receptors to noise is primarily dependent upon the activities that occur at the receptor location. For example, locations where people rest or sleep are considered to be more sensitive to noise than agricultural areas. Typically, noise impacts (particularly if occurring at night) may detract more from the quality of life for individuals than noise impacts during the day. The overall sensitivity of residents to noise-related impacts for this assessment is generally considered to be *Medium* during the day and *High* at night, except for recreational areas, medical institutions, and residential properties, which remain *High* day and night. Since there are residential areas within 0.5 miles of the Project site, noise impacts prior to mitigation are considered *High.*

As shown Section 7.2.1.2, Noise, noise will exceed the daytime IFC standard for ambient/ airborne noise levels (55 dBA). However, the results of the operational noise assessment show that the daytime noise levels will be below the IFC daytime noise guideline of 55 dBA L_{eq} at all nearby noise receptors, with the highest noise generated from facility operation at a nearby noise receptor being approximately 52 dBA L_{eq}. Further, NREI has committed to installing an earthen berm or other temporary sound barriers to reduce drilling noise; however, the potential exists that IFC daytime and nighttime noise guidelines will be temporarily exceeding during the drilling activities even with the additional noise mitigation measures.

Noise will exceed nighttime IFC standard for ambient/ airborne noise levels (45 dba) during drilling activities. To minimize the nighttime noise generation, some of the fans in the air-cooled condensers closest to the nearby residential receptors will be shut down. However, nighttime noise levels may exceed IFC nighttime noise guideline of 45 dBA L_{eq} at one noise receptor; the predicted nighttime noise at this receptor is approximately 48 dBA L_{eq}. Based on the noise assessment, additional noise mitigation could be provided by maintaining or planting vegetative buffers between the noise sources and the noise receptors. Noise as a result of traffic will be minimal for Project and Other Affected Communities because of relatively low traffic volumes. Therefore, after mitigation, noise impacts will be considered *Minor.*

Emergency response for potential accidents will also be an important consideration. Accidental gas leakages and explosions though extremely rare occurrences, could lead to fire outbreaks which may result in the loss of human lives, loss of wildlife, damaged properties and other serious health implications. Accidental release of fumes and other toxic emissions emanating from the power generation process implicate respiratory infections to workers as well as residents around the Project site. In the event of any explosions or leakages, local livelihoods could also be affected.

Dust-related nuisance impacts from construction are anticipated to be *Minor* and short-term. H_2S concentrations during operations are predicted to be well below World Health Organization thresholds of observed adverse effects. Overall health impacts of the Project are therefore considered to be *Negligible*.

Community safety impacts from increased traffic and associated safety risks will be considered to have a potential impact of *Moderate* significance. However, impacts will likely be short-term and localized and risks will be highest during the peak construction period. Children and other vulnerable people and livestock may

be more susceptible to traffic risks as elderly, children, and those with existing health problems will likely be most susceptible to the community health risks.

The following mitigation measures will be applied to reduce potential community health and safety impacts:

- The Project will be developed in line with WBG General EHS Guidelines and the Industry Specific Guidelines for Geothermal Power Generation and Electric Power Transmission and Distribution.
- Provide a cultural education program for workers from outside the area to help reduce community conflict.
- Provide opportunities for women and women's groups to participate in the work force to the extent safe and practical, and assist them in having good quality work standards so they can train others and are able to work with other companies in the future.
- NREI and any contractors shall involve external stakeholders (i.e. police or local authorities) in any on or off-site security incidents and ensure that appropriate incident response procedures are implemented. A Worker Policy and Code of Behavior shall be developed which includes guidance on visits, prescribed actions for conduct violations and a grievance mechanism for complaints.
- An important aspect of minimizing the spread of communicable diseases within the community is worker health screening, particularly as many workers are local people and in the context of the COVID-19 pandemic. A worker health screening program shall be developed and implemented, with measures to prevent the transmission of COVID-19.
- The Project will provide adequate and sufficient sanitation facilities for both female and male workers.
- Worker accommodation plans will be developed according to international requirements under IFC Performance Standard 2.
- Develop and implement a Workforce Code of Conduct that addresses issues such as anti-social behavior, drug and alcohol consumption, banning weapons, and including respect for women.
- Onsite health care shall be provided to ensure prompt medical attention.
- A Security Management Plan shall be developed in accordance with national law and the principles of good international industry practice. Access to the site will be controlled.
- The Project will train the security guards on Human Rights issues. The security guards will not be armed. They will coordinate with local government security forces in case of need and will ensure that security and human rights of local communities' members are respected.
- Community Emergency Response Plans will be developed and tested including consideration of workers and nearby residents in the vicinity of Project-related traffic. These will include emergency response related to COVID-19, traffic accidents and potential releases of chemicals and other hazardous materials.
- Workers shall receive proper Personal Protective Equipment (PPE) and associated health and safety training including procedures for emergency response.

With the mitigation measures described above, the residual impacts are expected to be reduced to *Minor* significance.

7.4.3 Socioeconomic Impact Summary

Table 7-34 below provides a summary of the socioeconomic related impacts, including community health, safety, and security related impacts, according to receptor. Within the respective impact assessments, a set of receptor-specific mitigation measures and project controls and mitigation measures have been

identified. It is assumed these mitigations and controls will be put in place by the Project, and therefore the impact assessment takes these into consideration when defining the sensitivity and magnitude to derive residual impact significance.

Table 7-34: Socioeconomic Impacts by Receptor

Receptor(s)	Impact (Activity Phase)	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
Residents and businesses near the exploration drill pads and injection pads	**Stress on local infrastructure** (housing, businesses) (During drill rig installation and drilling; and exploratory blow testing phase)	Low	Medium	Minor	Community Grievance Mechanism Local Employment and Supplier Development Plan Liaise with Ministry of Housing to assist in seeking suitable accommodations and setting rental rates to not drive up other costs in Project area	Negligible
Populations in the nearest settlements to the Project area	**Stress on local infrastructure** (housing, businesses) (During drill rig installation and drilling; and exploratory blow testing phase)	Low	Medium	Minor	See Stress on Local Infrastructure Project Controls above	Negligible
Existing potential workforce in Project-affected communities	**Economic benefits** (During access improvements and transportation; drill rig installation and drilling phases)	Positive	Positive	Positive	Workers Selection Management Plan Share Workers Selection Management Plan transparently with Project and Other Affected Communities to manage employment expectations Ensure contractors adhere to the Local Employment and Supplier Development Plan See additional mitigation measures in Section 7.4.2.1	Positive
Existing businesses in the towns	**Economic benefits** (During access improvements and transportation; drill rig installation and drilling phases)	Positive	Positive	Positive	See Economic Benefits Project Control above	Positive
Vulnerable groups (women)	**Economic benefits** (During access improvements and transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	Mainstreaming job opportunity information and emphasizing that NREI is open to women applicants. See additional mitigation measures in Workers Selection Management Plan.	Positive

Local and foreign tourists at Hamilton Estate	**Tourism** (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	Ensure Traffic Management Plan includes continued daytime access to Hamilton Estate Create interpretative and educational signage at Hamilton Estate related to Project activities Develop plans with Ministry of Tourism for tours of Project site (if feasible) and generate positive sentiment amongst tourists about the environmental advantages of geothermal power Implement monitoring plans which track and evaluate data on tourist experience in relation to Project impacts. See Section 7.4.2.4 for further mitigations.	Minor
Residents and businesses near the exploration drill pads and injection pads	**Noise** (During drill rig installation and drilling; and exploratory blow testing phases)	High	Medium	High	See Section 7.2.1.2 for Noise Mitigations. Noise Management Plan, to include monitoring system to identify any exceedances of international standards and requirement for a Corrective Action Plan if standards are exceeded.	Minor
	Traffic (During transportation and decommission phases)	Medium	Low	Minor	Traffic and Transportation Management Plan Emergency Response Plan Minimize truck deliveries during peak hours. Enforce a Journey Management Plan for truck deliveries. Provide traffic controls (flaggers) where conduit installation temporarily reduces road width. Provide buses for construction worker transport. For oversized vehicles, coordinate with local authorities, use escort vehicles, and provide advance notification to community. Minimize truck trips through efficient vehicle manifests.	Negligible
	Dust (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	Traffic and Transportation Management Plan	Minor

	H_2S Emissions (During drilling phases)	Low	Medium	Minor	There will be H_2S monitors installed to maintain concentrations below IFC and EHS Guidelines. If necessary, abatement systems will be used to remove emissions from non-condensable gases, such as wet or dry scrubber systems or a liquid phase/oxidation system. There will be adequate ventilation to prevent H_2S accumulation. Workers will be provided with PPE to protect them from H_2S emissions. Community Health and Safety Management Plan	Negligible
	Land Use (During all phases)	Medium	Medium	Moderate	See Tourism Project Controls above. See Aesthetic Resources, Section 7.4.2.6	Minor
	Water Use (During all phases)	Medium	Medium	Moderate	See Section 7.2.1.4 Water Resources	Minor
Populations in the nearest settlements to the Project area	**Noise** (During drill rig installation and drilling; and exploratory blow testing phases)	High	Medium	High	See Noise Project Controls above	Minor
	Traffic (During transportation and decommission phases)	Medium	Low	Minor	See Traffic Project Controls above	Negligible
	Dust (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	See Dust Project Controls above	Minor
	H_2S Emissions (During drilling phases)	Low	Medium	Minor	See H_2S Project Controls above	Negligible
	Land Use (During all phases)	Medium	Medium	Moderate	See Tourism Project Controls above. See Aesthetic Resources, Section 7.4.2.6.	Minor
	Water Use (During all phases)	Medium	Medium	Moderate	See Section 7.2.1.4 Water Resources	Minor

Populations residing and working along roads from Project area to Port	**Traffic** (During transportation and decommission phases)	Low	Medium	Minor	See Traffic Project Controls above	Negligible
Residents and businesses in the Area of Influence	**Community Health, Safety and Security** (During all phases)	Medium	Medium	Moderate	See Community Health and Safety Mitigation Measures in Section 7.4.2.8 and Emergency Preparedness and Response Plan	Minor
Commercial Port Users, Vessels in waters near Long Point Port	**Traffic and port capacity** (During construction phase)	Low	Low	Negligible	None.	Negligible
Road Users	**Road Capacity and Congestion** (During all phases)	Medium	Low	Minor	See Traffic Project Controls above.	Negligible
	Road Infrastructure (During all phases)	Medium	Medium	Moderate	Require trailer transport of tracked vehicles. Conduct pre-construction inspection of haul route from port to Project site. Monitor road conditions during construction and inspect haul route at conclusion. Communicate with the Nevis Public Works Department about road repair needs. Provide funding to repair road damage caused by Project activities.	Negligible
	Road Safety (During all phases)	Medium	Medium	Moderate	Schedule truck deliveries during the middle of the day, during hours when children are in school and most workers are at their place of employment. Engage with communities to promote awareness of road safety issues and practices for drivers and pedestrians. Provide information on scheduling and anticipated changes in traffic types and volumes due to Project construction	Negligible
Residents and businesses near the exploration	**Aesthetics**	Medium	Medium	Moderate	Minimize vegetative clearing Use lowest safe lighting intensity Use downward-facing full-cutoff lighting.	Minor

drill pads and injection pads					Paint buildings similar colors as surrounding vegetation.	

Source: ERM, 2020

7.5 Cultural Heritage Impact Discussion

There are no known prehistoric archaeological sites (Wilson 2006) and no currently listed historic sites or landmarks in the Project Area (https://nevisisland.com/nevis-history/historical-sites-landmarks). There is a known, non-listed historic site adjacent to the Project site, however, which is the sugar works ruins at the Hamilton Estate Plantation. The sugar work ruins are located south of Estate Road on Hamilton Heritage Trust land, opposite the proposed site of the injection well. The historic ruins are located approximately 25 meters from the nearest portion of the proposed injection well site.

7.5.1 Cultural Heritage Impact Assessment Methodology

7.5.1.1 Sensitivity

The importance or sensitivity of cultural heritage is determined through a combination of its scientific, historic, and/or cultural importance to local, national, and international cultural heritage stakeholders. This cultural heritage impact assessment utilizes a combination of national laws and international standards to define criteria for low, medium, and high sensitivity cultural heritage.

National Laws

The National Conservation and Environment Protection Act of 1987 establishes procedures for the designation and protection of a historic site, which it defines as “a place or site which is historic by reason of an association with the past and is part of the cultural and historical heritage of Saint Christopher and Nevis, and such a classification may include archaeological sites, historic landmarks, and areas of special historic or cultural interest.” According to the Nevis Tourism Authority, there are currently 17 historical sites and landmarks on Nevis. These are considered to be cultural heritage sites of national importance. One of these sites (Charleston) is also on the World Heritage Tentative List. This is considered to be a cultural heritage site of both national and international importance.

International Standards

The principal international standard for the protection of cultural heritage is Performance Standard (PS) 8 (Cultural Heritage) of the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012). The objective of PS 8 is to “protect cultural heritage from the adverse impacts of project activities and support its preservation…[and] promote the equitable sharing of benefits from the use of cultural heritage.” PS 8 defines cultural heritage as:

- Tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values;
- Unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and
- Certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

PS 8 differentiates between replicable, non-replicable, and critical cultural heritage, which are defined as follows.

- Replicable Cultural Heritage: Defined as "tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures."
- Non-replicable Cultural Heritage: Includes "(i) cultural heritage [that] is unique or relatively unique for the period it represents; or (ii) cultural heritage [that] is unique or relatively unique in linking several periods in the same site."
- Critical Cultural Heritage: Includes "(i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation."

The preferred mitigation measure for all cultural heritage impacts is avoidance. When this is not possible, PS 8 provides the following mitigation hierarchy (from preferred to least preferred) for replicable cultural heritage:

- Minimize adverse effects and implement in situ restoration measures;
- Restore the functionality of the cultural heritage in a different location;
- Permanent removal of historical and archaeological artifacts following national laws and internationally recognized practices by competent professionals; and
- Compensation for the loss of cultural heritage.

The removal of non-replicable cultural heritage will only take place if there is no technically or financially feasible alternative and the benefits of the project outweigh any heritage losses. The removal of critical cultural heritage will only take place in "exceptional circumstances" and after extensive consultation with affected communities and other stakeholders.

Criteria

Based on the national and international criteria described above, the Table below provides a summary of the criteria used to assess cultural heritage sensitivity in this analysis.

Table 7-35: Criteria for Cultural Heritage Sensitivity

Sensitivity	Description
Low	Resource is not specifically protected under local, national, or international laws or treaties; resource can be moved to another location without substantial loss of cultural value or replaced by a similar resource; resource is of a type that is common in the surrounding region; resource has cultural value to local stakeholders but limited value to national or international stakeholders; resource has limited scientific value or similar information can be obtained at numerous other resources; and/or resource meets PS 8 criteria for replicable cultural heritage.
Medium	Resource is specifically or generically protected by local or national laws but laws allow for mitigated impacts; resource can be moved or replaced, or data and artefacts recovered in consultation with stakeholders; resource has considerable cultural value for local and/or national stakeholders; resource has substantial scientific value but similar information can be obtained at a limited number of other resources; resource listed as a "historic site or monument" under the National Conservation and Environment Protection Act of 1987; and/or resource meets PS 8 criteria for non-replicable cultural heritage
High	Resource is protected by local, national, and international laws or treaties; resource cannot be moved or replaced without major loss of cultural value; legal status specifically prohibits

	direct impacts or encroachment on resource and/or protection zone; resource has substantial value to local, national, and international stakeholders; resource has exceptional scientific value and similar resource types are rare or non-existent; resource listed on UNESCO's World Heritage Cultural List or Tentative List; and/or resource meets PS 8 criteria for critical cultural heritage

Source: ERM, 2020

7.5.1.2 Potential Impacts (Exploration and Exploitation)

While the majority of cultural heritage impacts would happen during a construction and exploitation phase, it is also important to keep them in mind during exploration. Potential impacts to cultural heritage can be divided into two broad categories: direct and indirect. Direct impacts consist of physical disturbance or damage to a resource that alters, positively or negatively, the resource's scientific or cultural value. Indirect impacts are the result of changes to a resource's environment or natural setting that alter its cultural value or restrict or limit stakeholder access to it. Direct and indirect impacts can occur during the construction, drilling, testing, and decommissioning activities of the Project. Based on the proposed Project activities outlined in the Project Description, the Table below provides a summary of the Project's potential direct and indirect impacts to cultural heritage.

Table 7-36: Potential Direct and Indirect Cultural Heritage Impacts

Impact Type	Project Activities
Direct	■ Ground works such as vegetation clearance, grading, excavation, and well drilling, has the potential to damage, disturb, or remove known or previously undiscovered cultural heritage resources, particularly archaeological sites. ■ The use of heavy machinery during construction, increased vehicular traffic along access roads, and well drilling could generate localized vibrations sufficient to damage cultural heritage resources. ■ The accumulation of dust and pollutants due to vehicular traffic on cultural heritage resources could impact their cultural value. The accumulation of other pollutants could physically damage resources from chemical reactions between pollutant and resource material. ■ Project staff or subcontractor looting and/or vandalism. ■ Accidental events such as traffic accidents.
Indirect	■ Impacts to the setting of cultural heritage resources could include changes to the views to and from a resource (viewshed impacts), increased noise levels at a resource, and/or the production of strong or offensive odors at or near a resource. ■ Altering or restricting stakeholder access to resources due to construction during road upgrades and increased vehicular traffic during construction and well drilling.

Source: ERM, 2020

7.5.1.3 Impact Magnitude

The magnitude of impacts to cultural heritage are based on multiple factors, including impact nature (negative or positive), type (direct or indirect), duration (temporary, short term, long term, or permanent), extent (limited, local, regional, or transboundary), frequency (remote, rare, occasional, often, or constant), and likelihood (unlikely, possible, or certain). The Table below summarizes the criteria utilized to assess the magnitude of potential impacts to cultural heritage.

Table 7-37: Criteria for Cultural Heritage Impact Magnitude

Magnitude	Characteristics
Negligible	No discernable change in the physical condition, setting, or accessibility of the resource
Small	Small part of the resource is lost or damaged, resulting in a loss of scientific value; setting undergoes temporary or permanent change that has limited effect on the resource's perceived value to stakeholders; stakeholder/public or scientific access to the resource is temporarily impeded; and/or historic building suffers minor, reparable, structural damage.
Medium	A significant portion of the resource is lost or damaged, resulting in a loss of scientific or cultural value; setting undergoes permanent change that diminishes the site's perceived value to stakeholders; site becomes inaccessible for the life of the Project to stakeholders including traditional users or researchers; and/or historic building suffers major structural damage that is not reparable.
High	The entire resource is damaged or lost, resulting in a nearly complete or complete loss of scientific or cultural value; setting is sufficiently impacted to cause site to lose nearly all or all cultural value or functionality; site becomes permanently inaccessible to stakeholders including traditional users or researchers; and/or historic building suffers major structural failure.

Source: ERM, 2020

7.5.2 Assessment of Impacts

Although not currently listed by the Nevis Tourism Authority as a historical site or landmark, the Hamilton Estate is mentioned as a tourist destination on several tourism websites, and there is a Nevis Heritage Trail sign at the sugar work ruins advertising it as "one of the most complete plantation factories in the Caribbean" and "one of the last remaining inland sugar factories in Nevis." As a result, the sensitivity of the resource is considered to be Medium.

Construction of the proposed Project, especially at the injection well site, will require extensive ground-disturbing activities approximately 25 meters from the sugar work ruins. These ground-disturbing activities have the potential to cause Direct impacts to archaeological remains associated with the sugar work ruins and/or larger Hamilton Estate. Destruction of archaeological remains associated with the sugar work ruins will be Negative. Since archaeological remains are a non-renewable resource, direct impacts will be permanent. The extent of the impacts will be Limited to the Project site. The frequency of the impact will be Remote (i.e., they will occur once). The likelihood of direct impacts is Possible (not certain because there are currently no known archaeological remains within the Project site, but not unlikely due to the proximity of the sugar work ruins). The magnitude of the impacts is therefore considered to be Minor. There are no anticipated direct impacts from operations.

Construction of the proposed Project, especially at the injection well site, will also result in Indirect impacts to the sugar work ruins, specifically visual, dust, and noise impacts for tourists visiting the sugar work ruins, as well as a potential loss of access to the site. These indirect impacts will have a Negative impact on the resource's setting and accessibility. The duration of the impacts will be Short Term (i.e., confined to construction). The extent of the impacts will be Limited to the Project site, and the frequency of the impacts

will be Constant during construction. The likelihood will be Certain for visual/dust/noise impacts and Possible for loss of access. The magnitude of impacts is therefore considered to be Medium. There are no anticipated indirect impacts from operations. The binary plan and projection wells will not be visible from the sugar work ruins, and the low-lying injection pipeline will run along the north side of the road behind a barrier (Point Impact Analysis 2017:61)

7.5.2.1 Mitigation Measures

The measures below will be implemented to mitigate the Project's cultural heritage impacts.

- A Chance Find Plan will be developed and implemented. The Chance Find Plan will include a cultural heritage monitoring program, a chance find procedure, a cultural heritage training program, and a site protection program for the Hamilton Estate sugar work ruins. The chance find procedure will set forth the procedures to implement in the event that archaeological resources are encountered during ground-disturbing activities. Workers will be trained in identifying chance finds and implementing the chance find procedures.
- The Project will ensure that tourists can continue to access the Hamilton Estate sugar work ruins throughout construction.

7.5.2.2 Residual Impact Significance

With the implementation of the mitigation measures listed above, the residual impact significance is anticipated to be Negligible for direct impacts and Minor for indirect impacts during construction (Table below). There are no anticipated direct or indirect impacts to cultural heritage during operations.

Table 7-38: Cultural Heritage Impacts

Impact	Receptor	Sensitivity	Magnitude	Pre-Mitigation Significance	Mitigation Measures	Residual Significance
Direct Impacts	Hamilton Estate Plantation	Medium	Minor	Minor	Chance Find Plan	Negligible
Indirect Impacts	Hamilton Estate Plantation	Medium	Medium	Moderate	No disruption of access to the Hamilton Estate sugar work ruins	Minor

Source: ERM, 2020

7.6 Cumulative Impacts Assessment

This chapter focuses on potential cumulative impacts from the Project. Cumulative impacts are defined as the successive, incremental, and/or combined effects of a Project or activity, accumulated with other Projects or activities. Given that the Project is complying with the IFC PS, potential cumulative impacts are evaluated pursuant to IFC's Cumulative Impact Assessment (CIA) guidance - *Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for Private Sector in Emerging Markets* (IFC 2013).

7.6.1 Key Terminology for the CIA

The following are definitions for key terminology used in the CIA.

Cumulative Impact: Impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity added to other existing, planned, and/or reasonably anticipated actions, projects, or activities. For practical reasons, the identification, assessment, and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concern and/or concerns of Project-Affected Communities (PACs)[112].

CIA: Process to identify and evaluate cumulative impacts.

Other Projects: Existing, planned, or reasonably expected future developments, projects and/or activities potentially affecting Valued Environmental Components (VECs).

External Drivers: Sources or conditions that could affect or cause physical, biological, or social stress on VECs, such as natural environmental and social drivers, human activities, and external stressors. These can include climate change, population influx, natural disasters or deforestation, among others. These are typically less defined and planned than Other Projects.

Valued Environmental Components (VECs): Environmental and social components considered as important by the scientific community and/or potential PACs. VECs may include:

Physical features, habitats, wildlife populations (e.g., biodiversity, water supply);

Ecosystem services (e.g., protection from natural hazards, provision of food);

Natural processes (e.g., water and nutrient cycles, microclimate);

Social conditions (e.g., community health, economic conditions); and

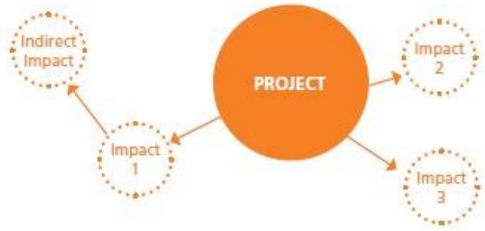
Cultural heritage or cultural resources aspects (e.g., archaeological, historic, traditional sites).

VECs reflect the public and scientific community's "concern" or special interest about environmental, social, cultural, economic, or aesthetic values (IFC 2013). According to the IFC's methodology, VECs are considered the ultimate recipients of cumulative impacts because they tend to be at the ends of ecological pathways.

7.6.2 Overall CIA Approach

Unlike an ESIA, which focuses on a project as a generator of impacts on various environmental and social receptors, a CIA focuses on VECs as the receptors of impacts from different projects and activities (see Figure 7-7). In a CIA, the overall resulting condition of the VEC and its related viability are assessed.

EIA: Project-Centered Perspective



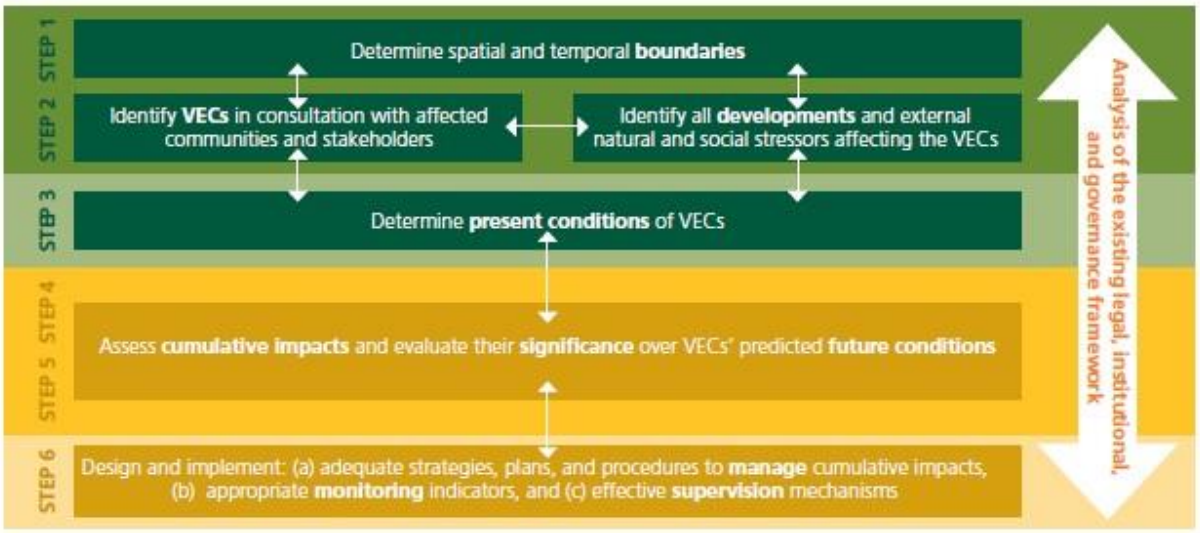
CIA: VEC-Centered Perspective

[112] PACs are defined as local communities potentially directly affected by the Project (consistent with IFC Performance Standard 1, paragraph 1 [IFC 2012a]).

Source: IFC 2013.

Figure 7-7: Comparing ESIA and CIA

The CIA was derived from desktop reviews of publicly available information, information obtained during the ESIA process, and information provided by NREI. The assessment follows the six steps for a CIA (see Figure 7-8). The process is iterative and flexible, with some steps having to be revisited in response to the results of others. For example, the VEC selection step usually needs to be adjusted after the potential impacts of the Project are identified. The steps are described in detail below.



Source: IFC 2013.

Figure 7-8: Summary of the Cumulative Impact Assessment Methodology

7.6.3 Limitations

The Handbook methodology takes into consideration the limitations that a private developer may face carrying out a CIA. The limitations applicable to this CIA include: (1) incomplete information about other projects and activities (e.g., the information is not available in the public domain); (2) uncertainty with respect to the implementation of future projects; and (3) difficulty in establishing thresholds or limits of acceptable change for VECs, and therefore the significance of cumulative impacts.

7.6.4 Determination of Spatial and Temporal Boundaries

The Project includes two main components: Geothermal Plant and TL. The components are located within the Hamilton Estate. The TL will extend for approximately 2.8 km, from the geothermal plant to the existing sub-station, and crosses two parishes: St. Paul's and St. John's. The proposed route will follow existing roads starting at Hamilton Estate, running through Blaziers Estate and Marion Heights before finishing at the Prospect Power Station via upper Stoney Grove.

Based on an assessment of the VECs for the CIA, it was determined that using the island of Nevis will be appropriate to serve as the spatial boundary of the CIA, in that it covers: (1) the extent of the selected VECs, and (2) the extent of the potential impacts from the Project, other projects, and external drivers. Charlestown is the largest town within the CIA area.

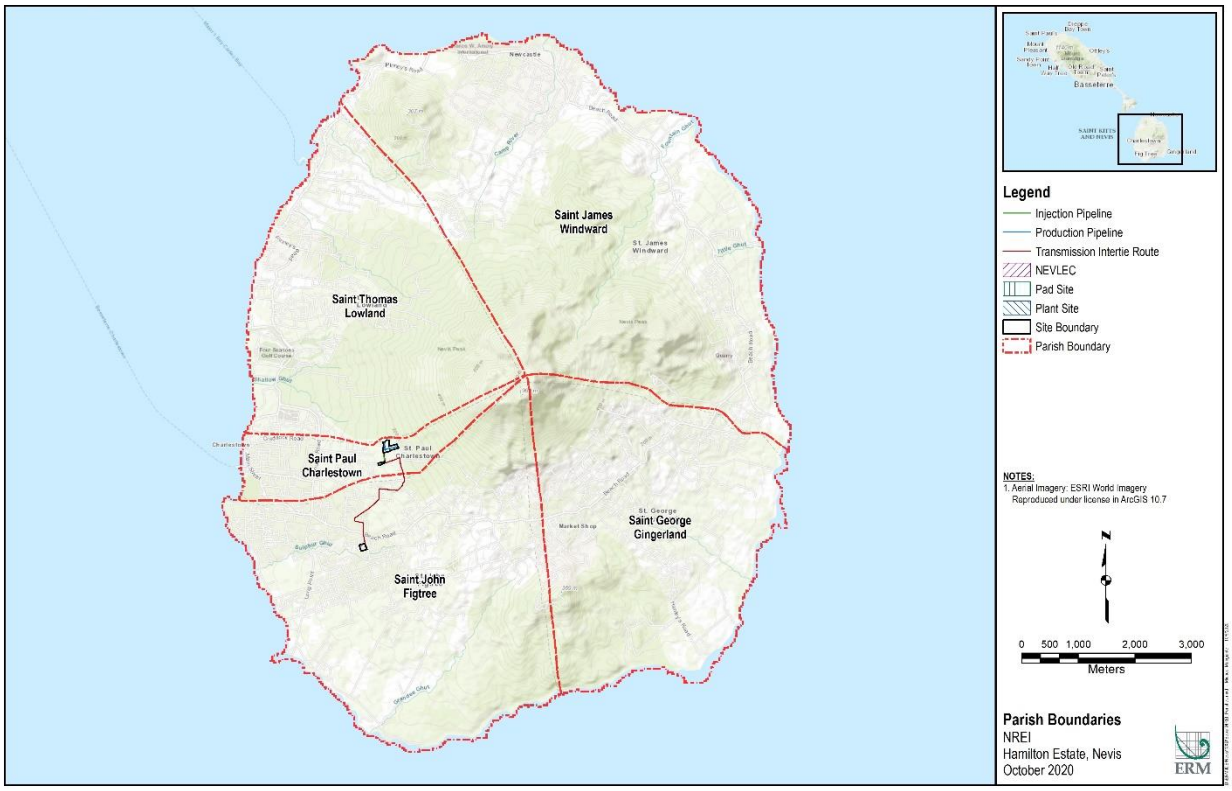


Figure 7-9: Spatial Boundary of the CIA with Parish Divisions

Temporal delimitation for a CIA is future focused and therefore frequently a challenge due to the uncertainty inherent to potential future other projects. For this reason, good international industry practice suggests consideration of a three-year temporal boundary when conducting a CIA (IFC, 2013), and revisiting the CIA periodically (every 3-5 years) to identify changes in proposed projects and external drivers and therefore expected cumulative impacts. Based on the expected timeline of the Project, construction of the TL will be completed after 90 days (depending on financing, this could be in 2021), and construction of the geothermal plant will likely be completed by 2022. The CIA uses an extended five-year temporal boundary, 2020 – 2025, to cover the Project construction and initiation of Project operation activities.

7.6.5 Other Projects

Through a thorough review of publicly available information and interviews with NREI personnel and stakeholders, ERM identified existing and future planned projects located within the spatial and temporal boundaries of the CIA, having the potential to result in cumulative impacts on identified VECs. The sources researched to identify other existing or planned projects for this CIA included:

- InterAmerican Development Bank (IDB) website
- Caribbean Development Bank (CDB) website
- OECS website
- World Bank Group website
- Development Finance Corporation website

- GlobalEnergyObservatory.org
- NIA website
- Local newspaper SKN News and radio Voice of Nevis
- There are no other major developments of this type (geothermal project) in Nevis and impacts of the Project are anticipated to be fairly unique to the development itself.

The Other Projects that have been identified nearby are:

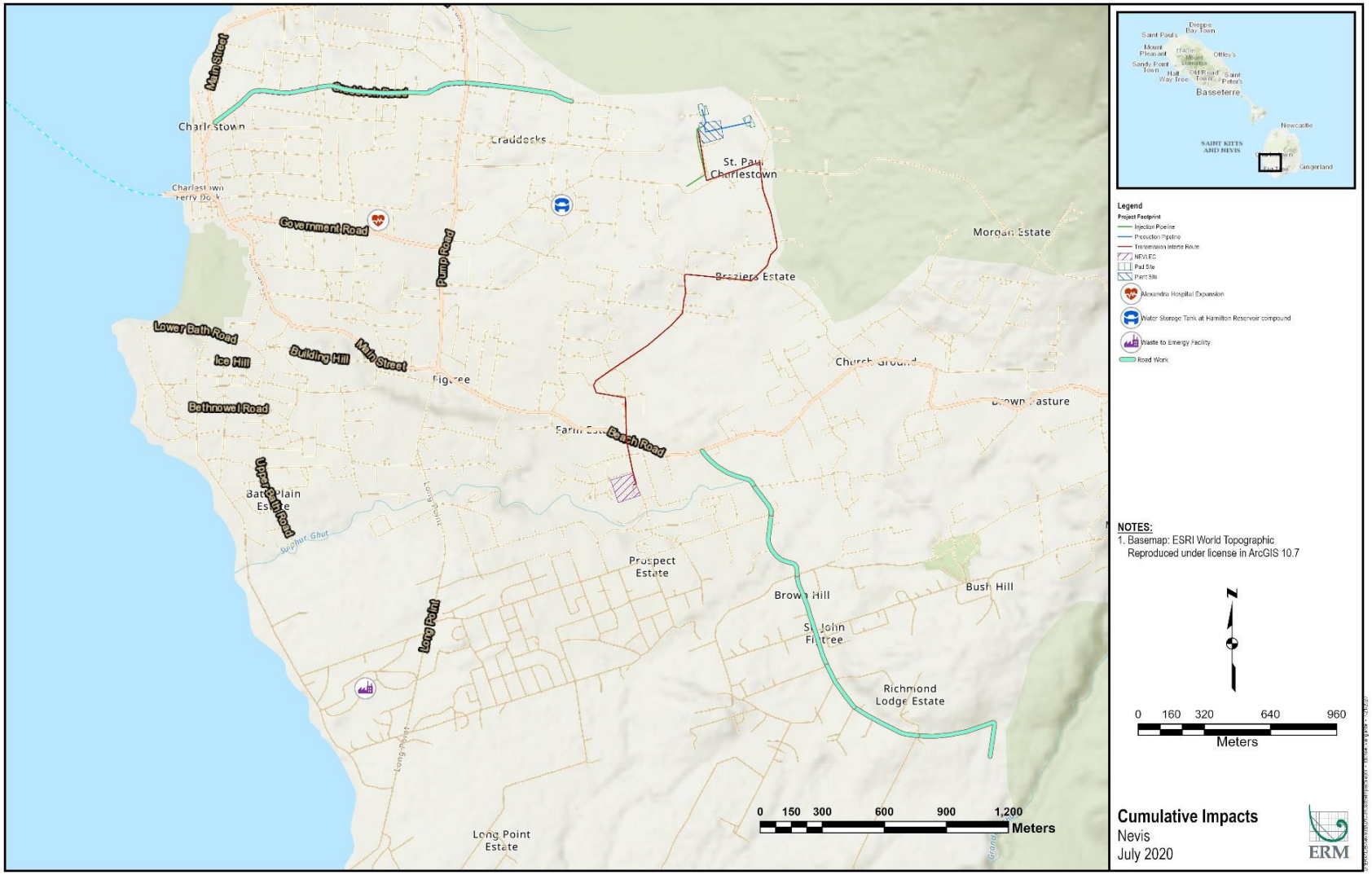
- Storage of water tanks by the Nevis Water Department at the Hamilton Reservoir compound, as part of the Water Enhancement Project. The Water Department drilled a water well about four years ago. There is also a storage tank, which is the second one to be constructed in the area. This project is about a mile down from the geothermal site.
- Expansion of the Alexandra Hospital, with construction expected to be completed in the first quarter of 2021.
- Roadwork on Craddock Road and Brown Hill Road.

Potential Other Projects that were identified but given their uncertainty are not included in the CIA are:

- A waste-to-energy facility located near the existing landfill in Long Point. In 2016, signing of an agreement between NEVLEC and USA-based Omni Alpha for the plant took place. As of 2016, an EIA was being completed for its siting. In addition to adding another 2 MW of electricity to the grid, the waste-to-energy plant will help address Nevis' current waste management issues by essentially converting garbage to electricity. Construction and commissioning of Nevis' waste-to-energy plant was anticipated in 2016/2017, but has not begun yet. Given that this project has not begun and that stakeholders confirmed that there are no plans for it in the future, this project will not be included in the CIA at this time.
- There is a possibility, given the expansion capacity of the selected site, that the Project may choose, at a future date, to expand to 30 MW. However, given that this expansion is purely speculative in nature, it will not be included in the CIA at this time. Despite that, it is important to note that an expansion would incur many of the same impacts (therefore exacerbating cumulative impacts) as the current Project.

It is important to note that, since the Project will progress to an exploitation phase, for the sake of cumulative impacts, exploration and exploitation impacts have been jointly considered under the term "Project."

The Other Projects are mapped below.



Source: ERM, 2020

Figure 7-10 Project Locations

7.6.6 External Drivers and Natural Hazards

ERM identified the following external drivers: natural hazards and climate change.

Natural hazards affecting the Project were described in Section 5.2.7.

With regard to climate change, projections for Nevis predict increased air temperature, change in the precipitation intensity-frequency regime, and increasing sea levels. Further, Nevis is most vulnerable to cyclones and hurricanes (and the resulting storm surge), floods, and droughts (WBG Climate Change Knowledge Portal). Climate change has the potential to result in changes in hurricane frequency and intensity which will have countrywide social and economic implications. Drought has been identified as a critical hazard for Nevis, with over 50% of the island receives less than 50 inches of rainfall per year. The greatest vulnerability lies in the south and south-east section of the island, particularly in the Charlestown water zone and Butlers/Manning water zone. This could be exacerbated by a change in the precipitation regime linked to climate change. Additionally, SKN water resources are vulnerable to sea level rise and temperature increase leading to higher evaporation rates. Given the centrality of ground water sources to the national water supply, the problem of water resources is primarily one of keeping and protecting the underground water resources (UNDP, St. Kitts and Nevis Climate Change Adaptation). Further, in Nevis, areas along the north-eastern to south-eastern seafront have relatively high vulnerability to storm surge, including Charlestown Port. Landslides, which are induced by saturated soils and/or seismic movements, pose a hazard for areas in the hills, mountain slopes, and areas with alluvial formations. Changes in precipitation and temperature could alter the stability of soil and increase the frequency of landslides.

Climate variability poses economical and health concerns, including increased drought durations, decreased water quality, increase risk of disease, crop loss and failure, infrastructure damage, disruption of energy services, biodiversity loss, land degradation, increased erosion, and reduced mangrove habitat. Furthermore, Nevis is prone to various natural hazards that have significant environmental, social, and economic impacts. Climate change has the potential to intensify the impacts from Nevis' natural hazards.

Population and key infrastructure in Nevis are typically in coastal areas, facing increased risk from tropical storms and sea level rise. Quantity and quality of both surface- and groundwater may be compromised by changing rainfall patterns and sea level rise, as was stated above. Additionally, ocean warming and acidification threaten coastal ecosystems, such as coral reefs and mangroves (USAID Caribbean Risk Report).

7.6.7 VEC Selection and Description

7.6.7.1 Selection of VECs

To be included, VECs must also be reasonably expected to be affected by both the project under evaluation (i.e., geothermal plant and/or TL) and some combination of other projects and external drivers. The identification of VECs was based on social and environmental receptors identified in the assessment of impacts of the ESIA, other known activities in the project area, supplemented with information obtained during the baseline survey, and the consultation process of this ESIA through interviews and meetings with various stakeholders.

The ESIA concluded that most of the resources affected by the Project will incur *Minor* or *Negligible* impacts that were very localized in extent and duration. The major environmental and social concerns related to the Project include the potential for impacts on biodiversity; community health and safety; and impacts related to landscape aesthetics, air quality, and noise. Chapter 5 of this ESIA describes the baseline conditions, and Chapter 7 describes the impacts of the Project on these VECs, respectively.

All potentially eligible VECs were analyzed against the following criteria: (1) confirmed to be valued by an identifiable stakeholder group; (2) reasonably expected to be impacted by the Project (i.e., at least one potential impact significance rating of Minor or above); ***and*** (3) reasonably expected to be potentially impacted by some combination of other projects and external drivers. To be included in the CIA, the VEC had to meet all three criteria. Table 7-39 presents the results of this analysis, and highlights the VECs that are selected in the CIA.

Table 7-39: Selection of VECs

VEC	Valued by Stakeholders	Potentially Affected by the Geothermal Plant Component of the Project [a]	Potentially Affected by the Transmission Line Component of the Project [a]	Potentially Affected by One or More Other Projects	Potentially Affected by One or More External Drivers
Selected VEC					
Terrestrial Biota (flora and fauna)	Yes	Yes	Yes	Yes	Yes
Land Traffic	Yes	Yes	Yes	Yes	No
Air Quality	Yes	Yes	No	Yes	No
Noise	Yes	Yes	Yes	Yes	No
Landscape Aesthetics	Yes	Yes	No	Yes	No
VECs not Selected for CIA					
Community Health	Yes	No	No	Yes	Yes
Surface Water Quality (freshwater)	Yes	No	No	No	Yes

[a] *At least one potential impact significance rating of Minor or above.*

7.6.7.2 Description of VEC Conditions

The baseline conditions of the selected VECs were previously described (see Chapter 5). The VEC baselines provide information on the VECs' current conditions, the anticipated resilience against external stressors and potential impacts (cumulative impacts and sources of stress), and thus provide an indication of their viability and sustainability.

7.6.8 Assessment of Cumulative Impacts

CIAs are future-oriented and Project contributions are assessed as the difference between the expected future condition of the VEC in the context of all possible known stressors and that condition plus the Project under evaluation. This step of the CIA assesses the future conditions of the VECs, considering the impacts from the Project, other projects, and external drivers. The potential impacts to VECs were established from the results of the Project ESIAs and other available information. If no impact information was available (e.g., for other projects), ERM assumed common sector-based impacts.

The results of the CIA are presented in tabular format. The significance of cumulative impacts is not evaluated in terms of the magnitude of change but in terms of VEC response and the resulting condition and sustainability. If cumulative impacts do not exceed the VEC threshold, the development of the project under assessment is considered acceptable. Given the intrinsic limitations of Project-driven CIAs, the

present assessment was not intended to obtain sufficient baseline information to establish thresholds of the selected VECs and therefore establish the significance of the cumulative impacts. Instead, based on the publicly available information and the findings of the stakeholder interviews, cumulative impacts were categorized by priority using the following definitions:

High Priority: The VEC is expected to or is currently being adversely impacted by other projects and/or external drivers and the future addition of the Project could incrementally contribute to the adverse impact. Actions will be implemented in the short term to mitigate potential adverse cumulative impacts on the VEC.

Medium Priority: The VEC could potentially be impacted by other projects and/or external drivers, and the Project could potentially contribute to the adverse impact. Actions will be implemented in the medium term to mitigate potential adverse cumulative impacts on the VEC.

Low Priority: The VEC is not expected to be potentially impacted significantly by other projects and/or external drivers, and therefore the Project impacts will not be expected to contribute to an adverse cumulative impact. No actions are required to mitigate potential adverse cumulative impacts on the VEC beyond proposed Project mitigation measures.

Table 7-40 summarizes the results of the assessment of cumulative impacts identified for the selected VECs. For the CIA, the potential impacts from the two components of the Project (Geothermal Plant and TL) are discussed separately given their differences in geography and potential impacts. The potential impacts from other projects that are within the same industry or sector are discussed together. Based on the potential cumulative impacts, a priority ranking is established for each VEC.

In summary, no High priority cumulative impacts were identified. Medium priority cumulative impacts were identified for noise and visual impacts. All other VECs are deemed as Low priority cumulative impacts.

Table 7-40: Summary of Cumulative Impact Assessment

VEC	Potential Impacts from the Geothermal Plant Component of the Project	Potential Impacts from the Transmission Line Component of the Project	Potential Impacts from Other Projects	Potential Impacts from External Drivers	Cumulative Impact	Priority Ranking
Terrestrial Biota (flora and fauna)	During Construction, activities such as pipeline installation, vegetation removal, soil movement, and use and storage of hazardous waste and materials may result in distribution and habitat changes for terrestrial fauna, death of fauna from collision with vehicles and elimination of terrestrial flora within the Project´s layout including access roads and laydown area. During Operations, activities such as routine maintenance, reception and delivery of materials, generation of electricity, storage and use of hazardous waste and materials, could cause the following potential impacts: hazardous materials spills on the ground, habitat loss, increased noise and vibrations, air emissions, and increased exposure to light. The disturbances described above could result in vegetation cover loss and distribution changes for the fauna found in the Geothermal Plant area. Mammals and birds are largely mobile, and most of the bird species identified during the baseline are considered migrant species, which makes them less vulnerable to anthropogenic intervention. Therefore, it is not expected that the Geothermal Plant construction and operations phases will result in an overall reduction in their abundance and diversity. The impact is considered **Minor.** Potential impact on less mobile species, such as the 12 species (two of them classified as Near Threatened by IUCN) of herpetofauna identified in the area, will be considered **Moderate**. There will be loss of flora, but NREI will carry out a replantation effort to help with visual impacts. The residual impact is considered **Minor**.	During Construction, activities such as soil movement and compaction, and transportation of machinery, equipment and parts could result in loss of vegetation cover. Given that the TL will be constructed on an existing right of way, the impact on vegetation cover loss is considered **Minor to Negligible**. As with the Geothermal Plant, the disturbances described above could result in distribution changes for the fauna along the TL. For mobile animals such as birds and mammals, the impact will be considered **Insignificant**, and for less mobile species, the impact will be **Moderate**. During Operations, activities such as routine maintenance, transmission of electricity, could cause the following potential impacts: hazardous materials spills on the ground, habitat loss, increased noise. To address potential impacts, NREI will have an Emergency Preparedness and Response Plan and noise-mitigating measures. The residual impact is estimated as **Negligible**.	*Alexandra Hospital Expansion*: Construction activities could disturb fauna in the area causing distribution and habitat changes from altered terrestrial habitats. The movement of trucks and heavy machinery could result in collisions with fauna. During Operations, potential impacts include artificial lights that can attract birds, collisions with project vehicles. *Road Network Improvement:* During Construction, activities such as soil movement and compaction, and transportation of machinery, equipment and parts could result in loss of vegetation cover. Because the roads that are being improved are already existing roads, the impact on vegetation cover loss is considered **Negligible.** *Water Enhancement Project:* Construction activities could disturb fauna in the area causing distribution and habitat changes from altered terrestrial habitats. The movement of trucks and heavy machinery could result in collisions with fauna. During Operations, potential impacts include collisions with project vehicles.	*Climate Change and Natural Hazards*: Rising temperatures associated with longer-term global climate change could potentially affect some special status species' ranges. Changes in precipitation and natural disasters could also affect vegetation growth and/or result in vegetation removal.	The Project, other projects, and external drivers could have potential negative impacts on terrestrial flora and fauna. Effects and disturbances caused by construction activities will be short-term and reversible. The Project embedded controls and management plans, including the vegetation plans related to visual impacts, will mitigate potential impacts to an acceptable level (mostly **Minor** or **Insignificant**). Additionally, the potential impacts are localized to the Project area within the larger CIA spatial boundary. In sum, the Project could potentially contribute incrementally to the adverse impact, but further VEC conversion and/or degradation is not likely to occur, or the Project's contribution will be expected to be negligible.	**Low**

Land Traffic	During Construction, which is expected to last 73 weeks, there will be an increase in the volume of land traffic, consisting of cars and light trucks transporting equipment and parts. This increase in road traffic can affect the conditions of road infrastructure, disturb users of adjacent properties, lead to traffic delays, and possibly have public safety implications. The volume of traffic generated will not exceed thirteen trips (including workers' transportation and deliveries) during the construction period. Therefore, high volume of traffic is not expected during the Construction phase. The impacts during Construction will be **Minor**. During Operations: Most traffic will be related to routine maintenance and regular operations activities, including daily commute of plant personnel which will be a maximum of 8 roundtrips per day. The impacts during Operations will be **Negligible**.	During Construction, which is expected to last 90 days, there will be a light increase in the volume of traffic. This increase in road traffic can affect the conditions of road infrastructure, disturb users of adjacent properties, lead to traffic delays, and possibly have public safety implications. Given that it is not expected that there will be more than 13 trips, the impacts during Construction will be **Minor**. During Operations: Most traffic will be related to routine maintenance. The impacts during Operations will be **Negligible**.	*Alexandra Hospital Expansion:* Construction activities could cause increased vehicle traffic for a defined period of time. *Water Enhancement Project*: During Operations, transport of personnel, heavy trucks delivering or picking up merchandise, and maintenance vehicles. *Road Network Improvement:* During construction some roads may be partially closed or block, increasing traffic through other roads for a defined period of time.	*Climate Change and Natural Hazards*: To the extent the frequency or intensity of severe storms and flooding could be influenced by climate change, these could potentially damage some roads.	The Project and other projects could contribute to the potential negative impacts on this VEC by increasing land traffic. The external driver could exacerbate traffic due to potential damages to road infrastructure. The mitigation measures proposed by the Project will appropriately mitigate the negative impacts and contribution (**Minor** for the short-term construction and then **Negligible** for operation). In sum, the Project could potentially contribute incrementally to the adverse impact, but VEC conversion and/or degradation is not likely to occur, or the Project's contribution will be expected to be negligible.	**Low**
Air Quality	During Construction, air quality could be negatively affected by activities related to earth movement and terrain preparation, movement of heavy machinery and increased land traffic in surrounding areas. These activities could increase the amount of dust and certain gases (CO_2 and H_2S) in the environment. These potential impacts will be localized and short term, and with the application of the proposed mitigation measures, the impact will be **Minor**. During Operations, there will be no emissions that will negatively affect air quality, apart from workers' travel to the site, which is consider **Negligible**. However, if the injection well has to be shut down during an emergency, there may be additional air emissions. Due to the extraordinary nature of this circumstance, it is expected to be of a low occurrence. Therefore, the impact will be **Minor or Negligible**.	During Construction, air quality could be negatively affected by activities related to earth movement and terrain preparation, movement of heavy machinery and increased land traffic in surrounding areas. These activities could increase the amount of dust and combustion gases from diesel engines (i.e. CO, SO_2, NO_x, $PM_{2.5}$, PM_{10}, VOCs) in the environment. These potential impacts will be localized and short term (24 months), and with the application of the proposed mitigation measures, the impact will be **Negligible**. During Operations, the main source of emissions that could negatively affect air quality will be combustion from diesel engines from maintenance trucks transiting the line if applicable. The impact will be **Negligible**.	*Alexandra Hospital Expansion:* During Construction for the expansion project, air quality could be negatively affected by activities related to earth movement, which will generate dust, and by emissions from diesel engines combustion gases. During Operations, no additional impacts are expected. *Water Enhancement Project*: During Construction for expansion projects and new tanks, air quality could be negatively affected by activities related to earth movement, which will generate dust, and by emissions from diesel engines combustion gases *Road Network Improvement:* During Construction for the expansion project, air quality could be negatively affected by activities related to earth movement, which will generate dust, and by emissions from diesel engines combustion gases.	*Climate Change and Natural Hazards*: Rising temperatures associated with longer-term global climate change could potentially affect the dispersion and thermodynamics of pollutants emitted to the air (Radaideh 2017).	The Project, other projects, and external drivers could contribute to the potential negative impacts on this VEC: decreased quality of the air shed. However, the other projects are already in operation and therefore their impacts are already considered in the Project baseline and residual impact assessment. According to models conducted as input for the Power Plant ESIA, the Project's embedded controls and mitigation measures proposed will appropriately mitigate the negative impacts and contribution (**Minor** or **Negligible**). In sum, the Project could potentially contribute incrementally to the adverse impact, but further VEC conversion and/or degradation is not likely to occur, or the Project's contribution will be expected to be negligible.	**Low**

Noise	During Construction, noise could be generated during cleaning, earth movement, pile-driving (on land and sea), general construction activities, and construction-related traffic. These are the typical sources of noise for the main construction activities as a result of material handling and use of machinery and equipment on the site. After mitigation measures, the impact during Construction will be **Moderate to Minor**. During Operations, the noise model indicates that the noise levels contributed by the Project operation in neighboring industrial zones and residential areas will be at or below the applicable Project limits after mitigation measures. The impact during Operations will be **Negligible**.	During Construction, activities such as movement of earth, access road construction will, and use of heavy machinery will increase noise levels at the work fronts. These impacts will be short-term and temporary in nature. After applying mitigation measures, the impact will be **Minor**. During Operations, an increase in noise level for the surrounding area is not expected, and the impact will be **Negligible**.	*Alexandra Hospital Expansion:* During Construction, noise could be generated during cleaning, earth movement, pile-driving (on land and sea), general construction activities, and construction-related traffic. These are the typical sources of noise for the main construction activities as a result of material handling and use of machinery and equipment on the site. During Operations, noise levels will likely be at or below current noise levels for the hospital. *Water Enhancement Project*: During Construction, noise could be generated during cleaning, earth movement, pile-driving (on land and sea), general construction activities, and construction-related traffic. These are the typical sources of noise for the main construction activities as a result of material handling and use of machinery and equipment on the site. During Operations, noise levels will likely be at or below the applicable limits. *Road Network Improvement*: During Construction, noise could be generated during cleaning, earth movement, pile-driving (on land and sea), general construction activities, and construction-related traffic. These are the typical sources of noise for the main construction activities as a result of material handling and use of machinery and equipment on the site	*Climate Change and Natural Hazards*: No impacts.	The Project and other Projects will contribute to the potential negative impacts on this VEC by increasing noise levels. Additionally, noise was identified as a highly valued VEC by stakeholders. Given that the location of the new Geothermal Plant is close to residential clusters, it could potentially contribute incrementally to the adverse impacts that already exist, and some degree of VEC conversion and/or further degradation or perception of degradation is likely to occur. Actions will be implemented in the medium term to mitigate potential adverse cumulative impacts on the VEC. Effects in the TL area are expected to be **Negligible**.	**Medium**
Landscape Aesthetics	During Construction, the landscape will be affected by site-clearing activities, construction equipment and construction-related traffic. Of these, the only permanent effect will be site-clearing, new infrastructure and the associated loss of flora. The Project has mitigation measures for visual impacts, including painting the plant components in a color similar to the vegetation and planting vegetation surrounding the Project. During Operations, there will be no further effects to landscape aesthetics. After mitigation measures, the impact during Construction will be **Moderate to Minor**.	During Construction, the landscape will be affected by construction equipment and construction-related traffic. However, given that the transmission lines will be underground on existing rights of way, there are no expected permanent visual impacts. Therefore, the TL's impact on landscape aesthetics is expected to be **Negligible**.	*Alexandra Hospital Expansion:* During Construction, the landscape will be affected by site-clearing activities, construction equipment and construction-related traffic. Of these, the permanent effects will be site-clearing, new infrastructure and the associated loss of flora. *Water Enhancement Project*: During Construction, the landscape will be affected by site-clearing activities, construction equipment and construction-related traffic. Of these, the permanent effects will be site-clearing, new infrastructure and the associated loss of flora. *Road Network Improvement*: *:* During Construction, the landscape will be affected by construction equipment and construction-related traffic. Given that the roads that are being improved are already in existence, there are expected to be no permanent negative impacts to landscape aesthetics.	*Climate Change and Natural Hazards:* Changing temperatures and higher risk of drought could lead to vegetation loss.	The Project and other Projects will contribute to the potential negative impacts on this VEC by reducing flora. Additionally, landscape aesthetics was identified as a highly valued VEC by stakeholders. Given that the location of the new Geothermal Plant is close to businesses and residential clusters, it could potentially contribute incrementally to the adverse impacts that already exist, and some degree of VEC conversion and/or further degradation or perception of degradation is likely to occur. Actions will be implemented in the medium term to mitigate potential adverse cumulative impacts on the VEC. Effects in the TL area are expected to be **Negligible**.	**Medium**

7.6.9 Cumulative Impacts Management Framework

Although there are other power sources on the island, the Project area is largely isolated and development of a 10 MW power plant is not anticipated to result in significant cumulative social impacts.

However, given the relatively pristine nature of the Nevis Peak, the importance of ongoing proper stakeholder engagement and understanding of community concerns, and the provision of (where possible and appropriate) training and employment opportunities to community members becomes even more paramount.

Internationally recognized good practices for managing cumulative impacts include:

Effective application of the mitigation hierarchy (avoid, reduce, and remedy) in the environmental and social management of the specific contributions of a project to expected cumulative impacts; and

Undertaking best efforts to engage, leverage, and/or contribute in multi-stakeholder collaborative initiatives or discussion groups to implement management measures that are beyond the capacity and responsibility of any individual project developer. (IFC 2013)

The embedded controls and management measures included in the ESIAs provide a means to mitigate the specific contributions of the Project to effects on VECs, following the mitigation hierarchy. Supplementing these controls and management measures, the CIA provides a framework of additional actions that NREI will apply in the regional and Project context to manage potential cumulative impacts on these VECs.

7.6.9.1 Project Level

Effective application of the mitigation hierarchy (avoid, reduce, remedy) to manage individual contributions of cumulative impacts will be applied as best practice. NREI has incorporated a number of physical or procedural embedded controls in the Project design. These are considered from the very start of the impact assessment process as part of the Project, and are factored into the pre-mitigation impact significance ratings. In addition, a number of mitigation measures detailed in the Geothermal Plant and TL ESIAs have been proposed to address potential impacts from the Project. The ESIAs also include an Environmental and Social Management Plan which summarizes the mitigation and monitoring measures for all environmental parameters, including the VECs assessed in this CIA.

At the Project level, the above measures are considered sufficient to address the contributions of the Project to cumulative impacts on the identified VECs.

7.6.9.2 Regional Level

Ultimately, the management of cumulative impacts is the responsibility of government and regional planners. However, it is considered best international practice that private-sector developers make best efforts to engage relevant stakeholders and promote management of cumulative impacts in their project areas (IFC 2013; Franks 2010).

The CIA identified medium priority cumulative impacts on the following VECs: Noise and Landscape Aesthetics. Therefore, the development and implementation of a multi-stakeholder collaborative management framework, to the extent possible, is recommended. NREI has agreed to foster such collaboration by participating, to the extent feasible and practicable, in working groups and/or industry organizations aimed at addressing management of potential impacts on regional resources to which NREI's Project could incrementally contribute with respect to cumulative impacts.

Here are some initiatives that NREI will take to strengthen a collaborative management framework for the VECs that the Project could contribute cumulatively with medium priority:

Landscape Aesthetics

- Promote the creation and maintenance of green spaces around the Project and other project areas.
- Promote the use of colors for Project components that blend into the natural surroundings.

Noise

- Promote information sharing related to low frequency noise between the Project and the other projects to enrich common information and identify potential synergies on information gathering and mitigation measures.
- Evaluate opportunities to use shared access roads with other projects in the vicinity.
- Promote the creation and maintenance of urban green spaces around the Project and other project areas.

Recommend the collaborative monitoring of noise among the projects, with adaptive management as needed

7.7 Summary of Exploration Impacts

As stated previously, the organization of this Environmental and Social Impact Assessment (ESIA) responds to the two differentiated stages of the proposed project: exploration and power plant construction and operation ("exploitation"), classified as category B+ and A respectively. Therefore, we are including a summary of exploration impacts here. While many of the impacts overlap for the exploration and exploitation phases, it should be noted that there are no vegetation clearing impacts for exploration.

The impacts applicable to each stage will be indicated as follows:

Exploration	Exploitation
	

Table 7-41 Summary of Exploration Impacts

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
Groundwater	Water quality	High	Small	Moderate	**Construction:** • Implement a Soil erosion and Sediment Control and Drainage Control plan; • Adopt and implement an SPCC Plan	Negligible - Minor
Soil	Soil erosion and landslides	Low	Negligible	Negligible	Plant vegetation along steep slopes; Prepare and implement a Soil Erosion and Sediment Control Plan; Use appropriate best management practices during clearance activities; Reuse excavated material.	Negligible
	Loss of soils suitable for agriculture	Low	Negligible	Negligible	Minimize Project footprint to the maximum extent possible; stabilize disturbed areas.	Negligible
Air Quality	Potential increase in H_2S concentrations (health hazard, odor nuisance)	Medium	Small to Medium	Minor to Moderate	Use abatement systems to remove H_2S emissions from non- condensable gases. Install an H_2S gas- monitoring network, taking into account the location of emissions sources and areas of community use and habitation. Provide adequate ventilation of nearby low-lying occupied buildings to avoid H_2S accumulation. Provide workers with educational materials, training, and PPE.	Minor
Noise	Increase in noise levels	Medium	Medium	Moderate	Noise Management Plan	Minor
Natural Hazards	Occurrence of natural hazards.	Medium	Medium	High to Moderate	Emergency Response and Preparedness Plan	Minor
Terrestrial Wildlife	Indirect: Operation of the drill rig and related drilling and testing activities will generate air emissions, the accumulation of which could adversely affect susceptible wildlife.	Negligible	Negligible	Negligible	■ Monitor air quality to meet IFC EHS standards ■ Implement air quality management plan	Negligible
	Indirect: Operation of the drill rig and related drilling and	Negligible	Negligible	Negligible	■ Monitor air quality to meet IFC EHS standards ■ Implement air quality management plan	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	testing activities will generate air emissions, the accumulation of which could adversely affect susceptible wildlife.					
	Direct: Harassment by Workers	High	Large	Moderate	■ Design and implement a worker Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife on Project site and vicinity ■ Installation of no disturbance, no hunting or harassment of wildlife signs in work areas ■ Installation of informative signs of biodiversity	Negligible
	Direct: The use of heavy machinery during well drilling may generate localized vibrations sufficient to harm ground- dwelling terrestrial wildlife.	High	Medium	Moderate	■ Implement pre-construction surveys to relocate ground dwelling wildlife from the activity sites to the extent practicable. ■ Assess the need of a shock absorber, or damper on the drill	Minor
	Direct: During construction of the drill rig, blow testing, the Project will generate high noise levels causing wildlife displacement and mask acoustic calling, thus affecting mating and feeding behaviors, within the BAOI	High	Medium	Moderate	■ Implement the noise reduction measures defined in Section 5.2.3. ■ Install temporary sound barriers, if construction is not during hurricane season ■ Maintain vegetation barriers surrounding Project Area ■ Install silencers to vehicles and heavy equipment ■ Survey areas for existing bat roosts and implement humane physical or acoustic exclusion measures to keep bats away from site ■ Avoid drilling and steam blow testing, as feasible, between April and August to avoid impacts on maternity colonies of bats, and bird breeding season ■ Construction of an earthen berm to help mitigate sound	Minor
	Indirect: exploration will introduce artificial night lighting which could act as attractants for night-migrating or nocturnal species, increasing the potential for collision with lighting structures, increased energy expenditure, or increased predation	Medium	Large	Major	■ Minimize the amount of artificial lighting used at the pad sites ■ Use directional lighting (downward facing lighting) and direction accessories ■ Avoid the use of UV light	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	Indirect: Project-related influx of workers in the area could indirectly increase hunting and bird poaching pressure	Low	Small	Minor	■ Design and implement a Community Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife within Project vicinity	Negligible
	Direct: Unforeseen accidents, such as a geothermal well blowout, will cause disturbance and degradation to habitat, and injury and mortality of nearby wildlife	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency shut-in plan to stop a well blowout and contain and clean up any fluids that may be released ■ Install fences around immediate Project well pads	Minor
Rare and Endemic Species	Indirect: Project-related vehicular traffic and site preparation activities may create dust, which can inhibit rare and endemic plants	Low	Small	Minor	■ Implement dust control procedures (e.g., watering) when needed to control	Negligible
	Direct: The use of heavy machinery during well drilling may generate localized vibrations sufficient to harm ground- dwelling rare and endemic terrestrial fauna	High	Medium	Moderate	■ Implement pre-construction surveys to relocate ground dwelling wildlife from the activity sites to the extent practicable. ■ Assess the need of a shock absorber, or damper	Minor
	Direct: During drill rig and blow testing will create noise (see Section 5.2.3), causing displacement of rare and endemic fauna from the Project Area and BAOI, which will modify wildlife use of the affected area. .	High	Medium	Moderate	■ Implement the noise mitigation measures defined in Section 5.2.3. ■ Maintain vegetation barrier around Project Areas ■ Install Sound barriers during construction if not within hurricane season	Minor
	Indirect: Artificial lighting will	Medium	Large	Major	■ Minimize the amount of artificial lighting used at the pad sites ■ Use directional lighting (downward facing lighting) and direction accessories	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	create disturbance and displacement of light-sensitive rare and endemic animal species and lights could act as attractants for night-migrating or nocturnal species, increasing the potential for collision with lighting structures, increased energy expenditure, or increased predation				■ Avoid the use of UV light	
	Direct: Harassment by Workers causing disturbance, mortality and injury within the BAOI	Medium	Large	Moderate	■ Design and implement a worker Wildlife Management education plan ■ Implement Worker Health and Safety plan which prohibits wildlife hunting activities, poaching, or any form of harassment ■ Installation of no disturbance, no hunting or harassment of wildlife signs in work areas ■ Installation of informative signs of biodiversity	Negligible
	Direct: Unforeseen incident, such as a geothermal well blowout, will cause disturbance, injury and mortality of nearby rare and endemic fauna and flora	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency Well Blowout Prevention Plan and Emergency shut-in plan to contain and clean up any fluids that may be released ■ Install fences around immediate Project well pads	Minor
Protected Areas	Indirect: Project-related activities will result in the temporary degradation of habitat quality within the nearby Nevis Peak.	Low	Small	Negligible	■ Implement the noise mitigation measures defined in Section 5.2.3 and the lighting ■ Implement Waste Management plan ■ Implement the emergency Well Blowout Prevention Plan; and ■ Design and implement a worker Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife within Project vicinity	Negligible
Residents and businesses near the exploration drill pads	Stress on local infrastructure (housing, businesses) (During drill rig installation and drilling; and exploratory blow testing phase)	Low	Medium	Minor	Community Grievance Mechanism Local Employment and Supplier Development Plan Liaise with Ministry of Housing to assist in seeking suitable accommodations and setting rental rates to not drive up other costs in Project area	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
and injection pads						
Populations in the nearest settlements to the Project area	Stress on local infrastructure (housing, businesses) (During drill rig installation and drilling; and exploratory blow testing phase)	Low	Medium	Minor	See Stress on Local Infrastructure Project Controls above	Negligible
Existing potential workforce in Project-affected communities	Economic benefits (During transportation; drill rig installation and drilling phases)	Positive	Positive	Positive	Workers Selection Management Plan Share Workers Selection Management Plan transparently with Project and Other Affected Communities to manage employment expectations Ensure contractors adhere to the Local Employment and Supplier Development Plan See additional mitigation measures in Section 7.4.2.1	Positive
Existing businesses in the towns	Economic benefits (During transportation; drill rig installation and drilling phases)	Positive	Positive	Positive	See Economic Benefits Project Control above	Positive
Vulnerable groups (women)	Economic benefits (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	Mainstreaming job opportunity information and emphasizing that NREI is open to women applicants. See additional mitigation measures in Workers Selection Management Plan.	Positive
Local and foreign tourists at Hamilton Estate	Tourism (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	Ensure Traffic Management Plan includes continued daytime access to Hamilton Estate Create interpretative and educational signage at Hamilton Estate related to Project activities Develop plans with Ministry of Tourism for tours of Project site (if feasible) and generate positive sentiment amongst tourists about the environmental advantages of geothermal power Implement monitoring plans which track and evaluate data on tourist experience in relation to Project impacts. See Section 7.4.2.4 for further mitigations.	Minor
Residents and businesses	Noise (During drill rig installation and drilling; and	High	Medium	High	See Section 7.2.1.2 for Noise Mitigations.	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
near the exploration drill pads and injection pads	exploratory blow testing phases)				Noise Management Plan, to include monitoring system to identify any exceedances of international standards and requirement for a Corrective Action Plan if standards are exceeded.	
	Traffic (During transportation and decommission phases)	Medium	Low	Minor	Traffic and Transportation Management Plan Emergency Response Plan Minimize truck deliveries during peak hours. Enforce a Journey Management Plan for truck deliveries. Provide traffic controls (flaggers) where conduit installation temporarily reduces road width. Provide buses for construction worker transport. For oversized vehicles, coordinate with local authorities, use escort vehicles, and provide advance notification to community. Minimize truck trips through efficient vehicle manifests.	Negligible
	Dust (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	Traffic and Transportation Management Plan	Minor
	H2S Emissions (During drilling phases)	Low	Medium	Minor	There will be H2S monitors installed to maintain concentrations below IFC and EHS Guidelines. If necessary, abatement systems will be used to remove emissions from non-condensable gases, such as wet or dry scrubber systems or a liquid phase/oxidation system. There will be adequate ventilation to prevent H2S accumulation. Workers will be provided with PPE to protect them from H2S emissions. Community Health and Safety Management Plan	Negligible
	Land Use (During all phases)	Medium	Medium	Moderate	See Tourism Project Controls above. See Aesthetic Resources, Section 7.4.2.6	Minor
	Water Use (During all phases)	Medium	Medium	Moderate	See Section 7.2.1.4 Water Resources	Minor
Populations in the nearest settlements to the	Noise (During drill rig installation and drilling; and exploratory blow testing phases)	High	Medium	High	See Noise Project Controls above	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
Project area						
	Traffic (During transportation and decommission phases)	Medium	Low	Minor	See Traffic Project Controls above	Negligible
	Dust (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	See Dust Project Controls above	Minor
	H2S Emissions (During drilling phases)	Low	Medium	Minor	See H2S Project Controls above	Negligible
	Land Use (During all phases)	Medium	Medium	Moderate	See Tourism Project Controls above. See Aesthetic Resources, Section 7.4.2.6.	Minor
	Water Use (During all phases)	Medium	Medium	Moderate	See Section 7.2.1.4 Water Resources	Minor
Populations residing and working along roads from Project area to Port	Traffic (During transportation and decommission phases)	Low	Medium	Minor	See Traffic Project Controls above	Negligible
Residents and businesses in the Area of Influence	Community Health, Safety and Security (During all phases)	Medium	Medium	Moderate	See Community Health and Safety Mitigation Measures in Section 7.4.2.8 and Emergency Preparedness and Response Plan	Minor
Road Users	Road Capacity and Congestion (During all phases)	Medium	Low	Minor	See Traffic Project Controls above.	Negligible
	Road Infrastructure (During all phases)	Medium	Medium	Moderate	Require trailer transport of tracked vehicles. Conduct pre-construction inspection of haul route from port to Project site. Monitor road conditions during construction and inspect haul route at conclusion.	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
					Communicate with the Nevis Public Works Department about road repair needs. Provide funding to repair road damage caused by Project activities.	
	Road Safety (During all phases)	Medium	Medium	Moderate	Schedule truck deliveries during the middle of the day, during hours when children are in school and most workers are at their place of employment. Engage with communities to promote awareness of road safety issues and practices for drivers and pedestrians. Provide information on scheduling and anticipated changes in traffic types and volumes due to Project construction	Negligible
Residents and businesses near the exploration drill pads and injection pads	Aesthetics (During all phases)	Medium	Medium	Moderate	Minimize vegetative clearing Use lowest safe lighting intensity Use downward-facing full-cutoff lighting. Paint buildings similar colors as surrounding vegetation.	Minor
Cultural Heritage	Direct Impacts	Medium	Minor	Minor	Chance Find Plan	Negligible
Cultural Heritage	Indirect Impacts	Medium	Medium	Moderate	disruption of access to the Hamilton Estate sugar work ruins	Minor

7.8 Summary of Exploitation Impacts

Below is a table that summarizes exploitation impacts, which will happen at the later stage of the Project.

The impacts applicable to each stage will be indicated as follows:

Exploration	Exploitation
	

Table 7-42 Summary of Exploitation Impacts

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
Groundwater	Water quality	High	Small	Moderate	**Construction:** • Implement a Soil erosion and Sediment Control and Drainage Control plan; • Store all fuels, lubricants, and other hazardous materials used in construction equipment in appropriate storage tanks and that will be located in bermed areas to provide secondary containment; • Adopt and implement an SPCC Plan to minimize the potential for accidental spills; and • Drilling muds and additives that will be used during well drilling will be nontoxic and biodegradable. **Operation:** • Store all potentially hazardous materials used during plant operations in appropriate storage devices that will be located in bermed areas to provide secondary containment; • Adopt and implement an SPCC Plan to minimize the potential for accidental spills; • The proposed plant facility will include secondary containment with capacity to hold the full volume of n-pentane held in the plant equipment; and • The proposed plant will include a 350,000-gallon brine containment pond that will be able to collect and contain two hours of full geothermal fluid flows during an accident or upset condition.	Negligible - Minor
Soil	Soil erosion and landslides	Low	Negligible	Negligible	Plant vegetation along steep slopes; Prepare and implement a Soil Erosion and Sediment Control Plan; Use appropriate best management practices during clearance activities; Reuse excavated material.	Negligible
	Soil contamination	Low	Small	Negligible	Preventive maintenance programs for equipment and vehicles (according to manufacturer requirements); Properly store and use of fuel and hazard materials; Control soil erosion in construction areas (hay bales and silt fences); Inject geothermal fluids.	Negligible
	Loss of soils suitable for agriculture	Low	Negligible	Negligible	Minimize Project footprint to the maximum extent possible; stabilize disturbed areas.	Negligible
Air Quality	Potential increase in H_2S	Medium	Small to	Minor to	Use abatement systems to remove H_2S emissions from non- condensable gases. Install an H_2S gas- monitoring network, taking into account the location of emissions sources	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	concentrations (health hazard, odor nuisance)		Medium	Moderate	and areas of community use and habitation. Provide adequate ventilation of nearby low-lying occupied buildings to avoid H_2S accumulation. Provide workers with educational materials, training, and PPE.	
Noise	Increase in noise levels	Medium	Medium	Moderate	Noise Management Plan	Minor
Natural Hazards	Occurrence of natural hazards.	Medium	Medium	High to Moderate	Emergency Response and Preparedness Plan	Minor
Terrestrial Vegetation	Direct: Ground works will result in the direct loss and disturbance of vegetation and secondary natural forest within the road improvement/ expansion locations, exploration well pads, injection pads and immediate surrounding areas (total 5 acres or 2 ha).	Medium	Small	Minor	■ Minimize Project footprint to the maximum extent feasible ■ Avoid removal of trees where possible ■ Maintain vegetation barriers along north, south and eastern borders as feasible	Negligible
	Direct: Ground works will result in the temporary loss and disturbance of vegetation and wildlife habitat within temporary construction laydown areas (2.2 acres or 0.89 ha)	Medium	Small	Minor	■ Minimize temporary construction impacts to the maximum extent possible ■ Avoid removal of trees where possible ■ Restore and revegetate temporary laydown areas post construction	Negligible
	Direct: Ground works and Project-related vehicle traffic and equipment brought from foreign countries	Low	Small	Negligible	■ Regular washing of Project related vehicles ■ Inspection of all equipment with arrival of overseas equipment. ■ Revegetation and restoration of temporary laydown areas with native and endemic species	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	may introduce or spread invasive and exotic plant species					
	Indirect: Equipment from foreign countries may introduce invasive insect pests that could cause disturbance to natural vegetation species in the BAOI	Low	Small	Negligible	■ Inspection of all equipment with arrival of overseas equipment ■ Follow Nevis pest mitigation and suppression regulations	Negligible
	Indirect: Project-related vehicular traffic and site preparation activities may create dust, the accumulation of which can inhibit vegetative growth.	Low	Small	Negligible	Implement dust control procedures (e.g., watering) when needed to control dust.	Negligible
	Direct: Unforeseen accidents, such as a geothermal well blowout, will cause disturbance and mortality of nearby vegetation	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency Well Blowout Prevention Plan and Emergency shut-in plan to contain and clean up any fluids that may be released ■ Restore and revegetate affected areas after accident	Negligible
	Indirect: Operation of the drill rig and related drilling and testing activities will generate air emissions, the accumulation of which could inhibit growth of vegetation	Negligible	Negligible	Negligible	■ Monitor air quality to meet IFC EHS standards ■ Implement air quality management plan	Negligible
	Indirect: Project-related	Low	Small	Negligible	■ Design and implement a Community Wildlife Management education training	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	influx of workers in the area could indirectly increase harvesting for the production of charcoal or increase domesticated animal grazing.					
Terrestrial Wildlife	Direct: Habitat loss for wildlife due to construction within the road improvement/ expansion locations, exploration well pads, injection pads and immediate surrounding areas (total 5 acres or 2 ha), as well as temporary laydown areas (2.2 acres or 0.89 ha).	Medium	Small	Minor	■ Minimize Project footprint to the maximum extent feasible. ■ Avoid removal of trees where possible ■ Maintain vegetation barriers along north, south and eastern borders as feasible ■ Restore and revegetate temporary laydown areas for wildlife habitat	Negligible
	Direct: Vegetation clearing and construction may result in disturbance, injury, or mortality for wildlife within the Project Area	High	Medium	Moderate	■ Conduct pre-clearing surveys prior to site preparation activities ■ Conduct bat roost surveys to scare away prior to site preparation activities by implementing humane physical or acoustic exclusion measures to keep bats away from site ■ Rescue and relocate sessile species to undisturbed sites	Negligible
	Direct: During Construction, the use of heavy machinery and increased vehicular traffic along access roads could result in direct mortality	Low	Small	Minor	■ Conduct pre-clearing surveys prior to site preparation activities to flush wildlife from the activity areas and ■ Relocate sessile species to undisturbed sites ■ Assess areas of wildlife crossing and install road signs	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	or injury of wildlife occurring within the Project Area.					
	Direct: During Operations, Increased vehicular traffic along roads could result in direct mortality or injury of wildlife occurring within the Project Area.	Low	Small	Minor	■ Implement a Worker Health and Safety Management Plan which includes strict enforcement of speed limits and limit nighttime driving ■ Assess areas of frequent wildlife crossing and install road signs	Negligible
	Indirect: Operation of the drill rig and related drilling and testing activities will generate air emissions, the accumulation of which could adversely affect susceptible wildlife.	Negligible	Negligible	Negligible	■ Monitor air quality to meet IFC EHS standards ■ Implement air quality management plan	Negligible
	Direct: Harassment by Workers during construction and operations to wildlife causing disturbance, mortality and injury within the BAOI	High	Large	Moderate	■ Design and implement a worker Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife on Project site and vicinity ■ Installation of no disturbance, no hunting or harassment of wildlife signs in work areas ■ Installation of informative signs of biodiversity	Negligible
	Direct: The use of heavy machinery during construction may generate localized vibrations sufficient to harm ground- dwelling terrestrial wildlife.	High	Medium	Moderate	■ Implement pre-construction surveys to relocate ground dwelling wildlife from the activity sites to the extent practicable. ■ Assess the need of a shock absorber, or damper on the drill	Minor
	Direct: During	High	Medium	Moderate	■ Implement the noise reduction measures defined in Section 5.2.3.	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	construction activities, the Project will generate high noise levels causing wildlife displacement and mask acoustic calling, thus affecting mating and feeding behaviors, within the BAOI				■ Install temporary sound barriers, if construction is not during hurricane season ■ Maintain vegetation barriers surrounding Project Area ■ Install silencers to vehicles and heavy equipment ■ Survey areas for existing bat roosts and implement humane physical or acoustic exclusion measures to keep bats away from site ■ Avoid drilling and steam blow testing, as feasible, between April and August to avoid impacts on maternity colonies of bats, and bird breeding season ■ Construction of an earthen berm to help mitigate sound	
	Direct: During operations the Project will create high noise levels from air condensers and generators causing wildlife displacement and mask acoustic calling, thus affecting mating and feeding behaviors, within the BAOI	Low	Small	Minor	■ Implement the noise reduction measures defined in Section 5.2.3 ■ Provide regular maintenance to vehicles ■ Maintain vegetation barriers surrounding Project Area ■ Construction of an earthen berm to help mitigate sound	Negligible
	Indirect: Construction and Operations will introduce artificial night lighting which could act as attractants for night-migrating or nocturnal species, increasing the potential for collision with lighting structures, increased energy expenditure, or increased predation,	Medium	Large	Major	■ Minimize the amount of artificial lighting used at the pad sites ■ Use directional lighting (downward facing lighting) and direction accessories ■ Avoid the use of UV light	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	Direct: Installation of a permanent 5,000 m3 brine pond occupying 0.9 acres (1.75 m deep) to hold geothermal fluids may cause injury or mortality to terrestrial wildlife	Low	Small	Minor	■ Installation of screen or nets over the brine collection pond to prevent wildlife contact with fluids	Negligible
	Indirect: Project-related influx of workers in the area could indirectly increase hunting and bird poaching pressure	Low	Small	Minor	■ Design and implement a Community Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife within Project vicinity	Negligible
	Direct: Unforeseen accidents, such as a geothermal well blowout, will cause disturbance and degradation to habitat, and injury and mortality of nearby wildlife	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency shut-in plan to stop a well blowout and contain and clean up any fluids that may be released ■ Install fences around immediate Project well pads	Minor
Rare and Endemic Species	Direct: Construction of Project Infrastructure will result in habitat loss for rare and endemic flora and fauna within the Project Areas (total 5 acres or 2 ha), as well as temporary laydown areas (2.2 acres or 0.89 ha).	Medium	Small	Minor	■ Minimize Project footprint to the maximum extent feasible. ■ Avoid removal of trees where possible ■ Restore and revegetate temporary laydown areas for wildlife habitat	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	Direct: Vegetation clearing and construction may result in disturbance, injury or mortality for rare and endemic flora and fauna within the Project Area	High	Medium	Moderate	■ Conduct pre-clearing surveys prior to site preparation activities ■ Rescue and relocate sessile rare and endemic fauna and flora to undisturbed sites	Negligible
	Indirect: Project-related vehicular traffic and site preparation activities may create dust, which can inhibit rare and endemic plants	Low	Small	Minor	Implement dust control procedures (e.g., watering) when needed to control	Negligible
	Direct: The use of heavy machinery during construction and well drilling may generate localized vibrations sufficient to harm ground- dwelling rare and endemic terrestrial fauna	High	Medium	Moderate	■ Implement pre-construction surveys to relocate ground dwelling wildlife from the activity sites to the extent practicable. ■ Assess the need of a shock absorber, or damper	Minor
	Direct: During construction and operations of the drill rig and blow testing will create noise (see Section 5.2.3), causing displacement of rare and endemic fauna from the Project Area	High	Medium	Moderate	■ Implement the noise mitigation measures defined in Section 5.2.3. ■ Maintain vegetation barrier around Project Areas ■ Install Sound barriers during construction if not within hurricane season	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	and BAOI, which will modify wildlife use of the affected area. .					
	Direct: During operations, the Project will create noise-causing displacement and mask acoustic communication of rare and endemic fauna.	Medium	Small	Minor	■ Implement the noise mitigation measures defined in Section 5.2.3. ■ Maintain vegetation barrier around Project Areas	Negligible
	Indirect: Artificial lighting will create disturbance and displacement of light-sensitive rare and endemic animal species and lights could act as attractants for night-migrating or nocturnal species, increasing the potential for collision with lighting structures, increased energy expenditure, or increased predation	Medium	Large	Major	■ Minimize the amount of artificial lighting used at the pad sites ■ Use directional lighting (downward facing lighting) and direction accessories ■ Avoid the use of UV light	Minor
	Direct: Harassment by Workers during construction and operations to wildlife causing disturbance,	Medium	Large	Moderate	■ Design and implement a worker Wildlife Management education plan ■ Implement Worker Health and Safety plan which prohibits wildlife hunting activities, poaching, or any form of harassment ■ Installation of no disturbance, no hunting or harassment of wildlife signs in work areas ■ Installation of informative signs of biodiversity	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
	mortality and injury within the BAOI					
	Direct: Unforeseen incident, such as a geothermal well blowout, will cause disturbance, injury and mortality of nearby rare and endemic fauna and flora	High	Medium	Moderate	■ Installation of blowout prevention equipment ■ Regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards ■ Implement the emergency Well Blowout Prevention Plan and Emergency shut-in plan to contain and clean up any fluids that may be released ■ Install fences around immediate Project well pads	Minor
Protected Areas	Indirect: Project-related activities will result in the temporary degradation of habitat quality within the nearby Nevis Peak.	Low	Small	Negligible	■ Implement the noise mitigation measures defined in Section 5.2.3 and the lighting ■ Implement Waste Management plan ■ Implement the emergency Well Blowout Prevention Plan; and ■ Design and implement a worker Wildlife Management education training ■ Implement Worker Health and Safety Management Plan that prohibits hunting and harassment of wildlife within Project vicinity	Negligible
Residents and businesses near the exploration drill pads and injection pads	Stress on local infrastructure (housing, businesses) (During construction phase)	Low	Medium	Minor	Community Grievance Mechanism Local Employment and Supplier Development Plan Liaise with Ministry of Housing to assist in seeking suitable accommodations and setting rental rates to not drive up other costs in Project area	Negligible
Populations in the nearest settlements to the Project area	Stress on local infrastructure (housing, businesses) (During construction phase)	Low	Medium	Minor	See Stress on Local Infrastructure Project Controls above	Negligible
Existing potential	Economic benefits (During construction)	Positive	Positive	Positive	Workers Selection Management Plan	Positive

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
workforce in Project-affected communities					Share Workers Selection Management Plan transparently with Project and Other Affected Communities to manage employment expectations Ensure contractors adhere to the Local Employment and Supplier Development Plan See additional mitigation measures in Section 7.4.2.1	
Existing businesses in the towns	Economic benefits (During construction)	Positive	Positive	Positive	See Economic Benefits Project Control above	Positive
Vulnerable groups (women)	Economic benefits (During construction)	Medium	Medium	Moderate	Mainstreaming job opportunity information and emphasizing that NREI is open to women applicants. See additional mitigation measures in Workers Selection Management Plan.	Positive
Local and foreign tourists at Hamilton Estate	Tourism (During construction)	Medium	Medium	Moderate	Ensure Traffic Management Plan includes continued daytime access to Hamilton Estate Create interpretative and educational signage at Hamilton Estate related to Project activities Develop plans with Ministry of Tourism for tours of Project site (if feasible) and generate positive sentiment amongst tourists about the environmental advantages of geothermal power Implement monitoring plans which track and evaluate data on tourist experience in relation to Project impacts. See Section 7.4.2.4 for further mitigations.	Minor
Residents and businesses near the exploration drill pads and injection pads	Noise (During construction and operation)	High	Medium	High	See Section 7.2.1.2 for Noise Mitigations. Noise Management Plan, to include monitoring system to identify any exceedances of international standards and requirement for a Corrective Action Plan if standards are exceeded.	Minor
	Traffic (During transportation and decommission phases)	Medium	Low	Minor	Traffic and Transportation Management Plan Emergency Response Plan Minimize truck deliveries during peak hours. Enforce a Journey Management Plan for truck deliveries. Provide traffic controls (flaggers) where conduit installation temporarily reduces road width. Provide buses for construction worker transport. For oversized vehicles, coordinate with local authorities, use escort vehicles, and provide advance notification to community.	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
					Minimize truck trips through efficient vehicle manifests.	
	Dust (During transportation; drill rig installation and drilling phases)	Medium	Medium	Moderate	Traffic and Transportation Management Plan	Minor
	Land Use (During all phases)	Medium	Medium	Moderate	See Tourism Project Controls above. See Aesthetic Resources, Section 7.4.2.6	Minor
	Water Use (During all phases)	Medium	Medium	Moderate	See Section 7.2.1.4 Water Resources	Minor
Populations in the nearest settlements to the Project area	Noise (During construction)	High	Medium	High	See Noise Project Controls above	Minor
	Traffic (During transportation and decommission phases)	Medium	Low	Minor	See Traffic Project Controls above	Negligible
	Dust (During transportation and construction)	Medium	Medium	Moderate	See Dust Project Controls above	Minor
	Land Use (During all phases)	Medium	Medium	Moderate	See Tourism Project Controls above. See Aesthetic Resources, Section 7.4.2.6.	Minor
	Water Use (During all phases)	Medium	Medium	Moderate	See Section 7.2.1.4 Water Resources	Minor
Populations residing and working along roads from Project	Traffic (During transportation and decommission phases)	Low	Medium	Minor	See Traffic Project Controls above	Negligible

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
area to Port						
Residents and businesses in the Area of Influence	Community Health, Safety and Security (During all phases)	Medium	Medium	Moderate	See Community Health and Safety Mitigation Measures in Section 7.4.2.8 and Emergency Preparedness and Response Plan	Minor
Commercial Port Users, Vessels in waters near Long Point Port	Traffic and port capacity (During construction phase)	Low	Low	Negligible	None.	Negligible
Road Users	Road Capacity and Congestion (During all phases)	Medium	Low	Minor	See Traffic Project Controls above.	Negligible
	Road Infrastructure (During all phases)	Medium	Medium	Moderate	Require trailer transport of tracked vehicles. Conduct pre-construction inspection of haul route from port to Project site. Monitor road conditions during construction and inspect haul route at conclusion. Communicate with the Nevis Public Works Department about road repair needs. Provide funding to repair road damage caused by Project activities.	Negligible
	Road Safety (During all phases)	Medium	Medium	Moderate	Schedule truck deliveries during the middle of the day, during hours when children are in school and most workers are at their place of employment. Engage with communities to promote awareness of road safety issues and practices for drivers and pedestrians. Provide information on scheduling and anticipated changes in traffic types and volumes due to Project construction	Negligible
Residents and businesses near the exploration drill pads and injection pads	Aesthetics (During all phases)	Medium	Medium	Moderate	Minimize vegetative clearing Use lowest safe lighting intensity Use downward-facing full-cutoff lighting. Paint buildings similar colors as surrounding vegetation.	Minor

Receptor	Impact	Sensitivity	Magnitude	Pre Mitigation Significance	Mitigation Measures	Residual Significance
Cultural Heritage	Direct Impacts	Medium	Minor	Minor	Chance Find Plan	Negligible
Cultural Heritage	Indirect Impacts	Medium	Medium	Moderate	No disruption of access to the Hamilton Estate sugar work ruins	Minor

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

It is important to note that not all plans will be applicable for both the exploration and exploitation phases. The plans applicable to each stage will be indicated as follows:

Exploration	Exploitation
	

8.1 Biodiversity Management Plan (Exploitation Phase)

8.1.1 Introduction

The following Biodiversity Management Plan (BMP) establishes a framework for minimizing impacts of the Nevis Binary Geothermal Development Project (Project) on terrestrial biodiversity when land clearing happens, if it needs to, during exploration. Most of the Project area has already been cleared; however, if any additional clearance is necessary (for pipelines and/or transmission lines), the following management plan will be implemented. The BMP's purpose is to set forth procedures that NREI will implement to manage and monitor terrestrial biodiversity during construction and operations of the Project. This will allow compliance with legal requirements and guidance standards for the environmental coordinator and the hired Contractors to avoid, minimize, and reduce adverse effects to terrestrial biodiversity receptors within the Project's BAOI. This BMP is based on the impacts and mitigation measures for terrestrial biodiversity values identified and described in the Project Description and the impact assessment provided in the Project's ESIA, prior Environmental Impact Assessments (PIA 2017) and the addendum to the EIA (PIA 2020). The current document compiles and summarizes relevant documentation regarding impacts and mitigation measures for terrestrial biodiversity, and provides a summary of the best management practices. Where necessary, supplemental measures are provided.

The mitigation activities presented in this plan are aligned with Performance Standard 6 of the IFC, *Biodiversity Conservation and Sustainable Utilization of Living Natural Resources* (IFC 2012). It is anticipated that the BMP will be periodically updated as the Project design advances and as improvements and adaptive management are identified through all stages of the Project.

The key objectives of this Plan are:

- Follow the guidelines of international best practices, legal requirements and commitments; and ensure these are met throughout the construction and operation activities that relate to management of biodiversity impacts;

- Define and implement the roles and responsibilities, training and scheduling towards avoiding, minimizing, reducing, and mitigating impacts on terrestrial biodiversity in the Project's BAOI; and
- Define the Key Performance Indicators (KPIs) that will be used to assess the effectiveness and success of the Plan at managing biodiversity impacts.

8.1.2 Scope

This plan is part of NREI's ESMP document system. It covers all NREI activities with the potential to impact terrestrial biodiversity. It includes activities carried out on NREI's behalf by contractors and subcontractors. The plan does not substitute any other legal means.

8.1.3 Key Impacts

Direct and indirect impacts to biodiversity can occur during the following Project Construction and Operation activities.

Construction phase:

- Construction preparation for well pads, injection pads, transmission intertie line, brine pond and temporary laydown areas, which will result in vegetation loss and disturbance, noise, wildlife disturbance and displacement;
- Operation of the drill rig and steam blow testing, which will create noise, vibration and related wildlife disturbance;
- Operation of heavy machinery and vehicles for transportation, which will create noise, vehicular mortality and related wildlife disturbance; and
- Use of artificial night light during construction activities, which will create wildlife disturbance and mortality.

Operations phase:

- Operation of the air cooler condenser fans, which will create continuous noise and related wildlife disturbance;
- Use a brine pond to collect geothermal fluids, which will create wildlife injury and mortality;
- Use of artificial night light during operations, which will create wildlife disturbance and mortality; and
- Unexpected event of well blow out, which will result in vegetation loss and disturbance, noise, wildlife displacement, injury and mortality.

The most significant Project impacts on terrestrial biodiversity will occur during the construction phase, which includes onsite vegetation clearing, an increase in noise and vibrations, the potential to injure or kill wildlife species, and the potential for harassment of flora/fauna by the construction/operation employees. During operations, the most significant Project impact to flora and fauna biodiversity is an unlikely scenario of a well blowout, which will cause additional direct impacts of disturbance, injury and/or mortality of terrestrial wildlife species. Artificial light is the most significant indirect impact on terrestrial wildlife throughout construction and operations.

The primary species of concern with respect to direct mortality and injury include:

1. Endemic reptiles that will be subject to injury or mortality during ground disturbing activities, such as St. Christopher's Ameiva (*Pholidoscelis erythrocephalus, NT),* and the Leeward Blindsnake (A*ntillotyphlops geotomus, NT*).

2. Native and endemic bird species and their nests that may be impacted which inhabit, and regularly use the Project area for foraging such as (*Loxigilla noctis*, LC).
3. Bats that regularly forage in the Project area, such as Antillean Fruit-eating Bat (*Brachyphylla cavernarum, LC),* an Antillean endemic, and their roosts which may occur near the Project.

8.1.4 National/ International Standards

National standards and action plans relevant to biodiversity protection and management that are established under the **Federation of St**. **Kitts and Nevis (SKN)** laws and regulations include the following:

- **National Conservation & Environment Protection Act (No. 5, 1987)**: An Act to provide for the better management and development of the natural and historic resources of Saint Christopher and Nevis for the purpose of conservation; the establishment of national parks, historical and archaeological sites and other protected areas of natural or cultural importance; the establishment of a Conservation Commission; and for other matters connected thereto.
- **International Trade in Wild Fauna and Flora Act (No. 41, 2009):** An Act to provide the legal framework for implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and to provide for related and incidental matters.
- **St Christopher and Nevis National Trust Act (No 12, 2009):** An Act to provide for the establishment of a National Trust for the purpose of administering and preserving sites, buildings and objects of historical, archaeological, architectural, environmental and artistic importance to the Island of Saint Christopher and Nevis, and to provide for related and incidental matters.
- **National Biodiversity Strategy & Action Plan (2014-2020):** Action plan of 22 projects and strategies to conserve biodiversity and natural resources management across eleven months to 5 years with the involvement of government agencies, NGOs and research groups.
- **St. Kitts and Nevis National Environmental Action Plan (NEAP, 1994);** The action plan identifies the environmental issues affecting St. Kitts and Nevis in a comprehensive, multi-sectoral framework and sets a long-term strategy for maintaining the country's natural environment, the health and safety of its population and its cultural heritage as economic development occurs.

SKN is a signatory to various international conventions related to biodiversity:

- **The Convention on Biological Diversity (CBD):** Objectives of the CBD include conservation and sustainable use of biological diversity, access to and equitable distribution of the benefits of genetic resources, and appropriate transfer of technology.
- **The Convention on the International Trade in Endangered Species (CITES):** CITES's goal is to safeguard against threats to the survival of listed species arising from international trade in specimens, parts, or products of those species.
- **The International Plant Protection Convention (IPPC):** IPPC is an intergovernmental treaty with the goal of protecting the world's plant resources from the spread and introduction of pests and promoting safe trade.

In addition to the above international conventions, the International Finance Corporation's Performance Standard 6 (IFC PS6) requires that project sponsors avoid, minimize, and restore threats to biodiversity arising from their operations. IFC PS6 specifies that mitigation measures should be designed to achieve 'no net loss' of biodiversity and favor impact avoidance and prevention over reduction and compensation (offsetting). IFC PS6 also requires project developers to develop and implement a monitoring and evaluation program to document the project's progress at implementing the agreed-upon controls, restoration, and mitigation measures, and their effectiveness at mitigating for impacts.

8.1.5 Mitigation Measures and Controls

8.1.5.1 Minimize Project Footprint

According to the 2020 Addendum to the EIA (2017), NREI has redesigned the Project footprint and proposed equipment to minimize overall Project impacts. The Project modifications consist of minimizing the Project footprint and vegetation clearing from 10.7 acres (4.33 ha) to 5 acres (2.02 ha) by consolidating the two production well pads. The new well pad design will occupy 1.2 acres along the southeastern quadrant of the Project. This change eliminates the well pad on the northern portion of the property.

8.1.5.2 Pre-clearing Surveys, and Rescue and Relocation

Once the area slated for vegetation removal has been demarcated, terrestrial plant and fauna specialists will conduct pre-vegetation clearing surveys. Specialists with demonstrated experience and knowledge of terrestrial plant and fauna species will be required to confirm whether any endangered or endemic fauna are present in the area to be cleared, and to be handled appropriately. The following management measures will be utilized:

- Acoustic deterrents will be used to disperse terrestrial ground-dwelling and flying fauna;
- Specialists will record any fleeing fauna by type and number of individuals, as feasible, to supplement baseline records;
- Bat specialists will survey the Project area demarcated for vegetation removal as well as its 50 m buffer for roosts to be humanely excluded from the area;
- Any reptiles, amphibians, or small mammals remaining in the area slated for vegetation removal will be captured, photographed, measured, and relocated to suitable nearby habitat. This will be performed by specialists and trained locals. Suitable habitat will be determined prior to clearing surveys and will be within similar ecological characteristics and requirements;
- If Project vegetation removal and ground-disturbance activities cannot avoid the bird-nesting and bat-breeding season (April through August), pre-clearing surveys will identify features to be avoided and 20 m buffers will be set up around sensitive areas during the construction phase. In this situation, the Environmental Coordinator will be notified and specialists will be contacted to identify species and determine how to avoid or relocate;
    - Examples of sensitive features and areas are active bird nests, maternal bat roost colonies and other microhabitats that are being use for reproduction and raising young.
- Rescue and relocation efforts will be recorded within a monitoring database. Every individual rescued will be provided an ID number. Rescue and relocation records will include a photograph, time, date, collector, and location coordinates and mortality (if any).

8.1.5.3 Best Practice Vegetation Removal

NREI will implement and manage activities related to the vegetation removal and tree felling process. The specific objectives of this project are to implement best-practice vegetation clearing methods. To minimize impacts, NREI will implement the following best-practice measures:

- Technical delimitation of authorized clearing areas, using security tape at a height of 1.5 m, visible enough to isolate the intervention area, and implementation of enforcement measures to avoid footprint “creep” into surrounding areas;
- Minimize cleared areas and any temporary work camp sites;

- Maintain vegetation barriers where feasible along the northern, southern, and eastern boundaries;
- Inspection of each target tree to identify risks and potential emergency situations, considering the location, inclination, physical state, extraction trails, wind conditions, and determination of the desired fall path;
- Completion of vegetation removal and tree felling by workers with experience and training in tree felling;
- Biologist identification of any sensitive fauna species in the area where tree felling will occur;
- Tree felling during a time when impacts to fauna (breeding birds and bats) are minimal;
- One to two days prior to tree felling and vegetation removal, fauna dispersal utilizing noise (i.e., horns, machine equipment-chainsaws or other appropriate measures, etc.); See 1.6.2 above;
- Presence of wildlife specialist onsite as observers during vegetation removal to capture and relocate fauna offsite to undisturbed nearby habitat;
- Use of low-impact and directed logging techniques;
- A phased, directional approach to tree felling to allow mobile animals to escape from forest clearing activities; trees will be felled in a direction that will minimize damage to neighboring vegetation; and
- Manage cleared material to minimize potential bush fire sources.

8.1.5.4 Revegetation of Temporary Areas

The Project will support measures designed to conserve and restore as much vegetation as possible within the Project Area as well as enrich habitat for fauna species that will be displaced by the proposed Project activities. The 2020 Addendum to the EIA included several measures to conserve the existing trees and vegetation along the southern, northern and eastern boundaries of the Project and undeveloped areas, as well as, revegetate the disturbed landscape within the temporary laydown areas. The details of these measures are described herein:

- Rehabilitation of all disturbed areas (e.g., temporary laydown areas) will be undertaken following construction. This will be done in such a way as to facilitate natural regeneration of vegetation;
- Specialists will determine selection of native trees and shrubs to replant to ensure appropriate succession of native trees and reduce the potential for bush fires;
- In appropriate areas, native and endemic trees that may be used as food sources by native bats and birds will be planted in temporary cleared areas (i.e., plum (*Spondias mombin*), fig (*Ficus citrifolia*), rough velvetseed (*Guettarda scabra*), milkbush (*Rauvolfia viridis*), and *Pisonia subcordata)*;
- Habitat will also be restored and/or enhanced to increase the value to wildlife. For example, rocks and woody debris can be added to areas to increase availability of wildlife refuges;
- Native vegetation will be conserved near Project infrastructure; and
- Measures to conserve the revegetated areas from feral goats and other grazing domesticated species will be applied if necessary.

8.1.5.5 Artificial Lighting Management

Impacts due to artificial lighting at night for wildlife are wide ranging. In the natural world, light serves as an information source to wildlife and artificial lighting can provide misleading cues (Gaston et al., 2013). They include changes to behavior that occur at night, such as reproduction and migration of insects, amphibians, fish, birds and bats. Artificial nighttime lighting can also disrupt plants through disruption of the natural day-night cycle and can affect the circadian rhythms of animals. Night lighting can cause significant mortality to

insects (Longcore and Rich 2004) and even negatively impact pollination, resulting in less fruit production and impacts on the terrestrial food chain as well as ecosystem services (pollination benefits to people). While exact impacts to particular species are often unstudied, it is reasonable to assume that adding significant amounts of nighttime light to a formerly dark area will result in some ecological impacts.

Therefore, the Project will implement measures to minimize the impacts due to artificial nighttime lighting, which will be designed to ensure lighting is placed strategically and implemented throughout the duration of the Project lifetime. The Project will consider light intensity and configuration, spacing, height, and directionality to reduce the intensity and spillage of light to minimize overall illumination. The following measures will be implemented to minimize the impacts of artificial nighttime lighting:

- Reduce the duration of light to extent possible via the use of timers and motion detectors;
- Avoid ultraviolet (UV) light and shorter wavelength light;
- Use low wattage lamps (<70 Watts (W));
- Use yellow light or red light that does not contain blue, violet, or UV wavelengths, as these attract fewer insects than UV or bluish/white lights;
- Plan and design light intensity and configuration, spacing, height, and directionality to reduce the intensity and spillage of light to minimize overall illumination;
- Use light only when needed and preferably turn off lights during times of peak bird migration;
- Ensure there are light-exclusion zones within the Project property;
- Avoid upward pointing lights and install directional accessories on existing light units to direct light away from sensitive areas and minimize light spill, if necessary; and
- Adapt mitigation measures if lights are shown to have an impact based on bird, bat, and invertebrate monitoring reports.

8.1.5.6 Noise and Vibration Mitigation

High noise levels and vibrations can induce stress levels in wildlife, disrupt communication and alter behavior, and cause mortality, displacement and injury. High noise impacts will mask bird calling (60 dB) cause displacement and could cause nest abandonment by birds if noise-producing activities are initiated after the onset of the breeding season, which occurs from late April to August for many species on Nevis (Steadman *et al.* 1997). Responses to high noise impacts vary for species of bats, however, abandoning roosts may cause roost abandonment potentially reducing survivorship of adults and young, especially for maternal colonies from mid-April to August. Ground vibrations, as opposed to air vibrations, may adversely affect herpetofauna (reptiles and amphibians) by reducing predator detection, increasing stress levels, and disrupting cues necessary for orientation, navigation, and mating (Andrews et al 2006).

Noise impacts from the Project construction is expected to impact nearby fauna due to its magnitude and duration, which will occur for at least one reproductive cycle. Therefore, the Project will implement measures to minimize the impacts due to noise and vibration for each Project phase.

During Construction phase:

- Maintain existing trees and vegetation along Project boundaries and undeveloped areas;
- Maintain vegetation near to air-cooler condenser fans;
- Install hurricane protection screens around air-cooler condenser fans for added noise mitigation effects;

- Sequence drilling operations so that the vibration-intensive activities do not occur simultaneously;
- Install sound-suppressive devices such as silencers and mufflers on heavy equipment and trucks as necessary;
- Install shock absorbers on drill machinery, as necessary;
- Assess the use of sound barriers when not simultaneous to hurricane season;
- Cut material from the containment pond will be installed as an earthen berm to mitigate noise impacts; and
- Where applicable, avoid well blow venting and drilling during breeding season of birds and bats (April to August).

During Operations Phase:

- Minimize noise levels from air fans with the use of fans as opposed to condensers;
- Adjust air-cooled condenser units speed drives to reduce noise if necessary;
- Minimize noise levels at night (10 PM to 7 AM) by reducing operating air condenser fans from 24 to 12;
- Ensure and maintain all fixed and mobile equipment in good working order; and
- Maintain and plant dense vegetation near air cooler condensers.

8.1.5.7 Invasive Species Management

Invasive species are considered the greatest threat to biodiversity in geographically and evolutionarily isolated systems such as islands of the Caribbean, due to their unique endemism and high vulnerability (Kairo *et al.* 2003). With colonization and the era of sugar plantations, several invasive species were introduced such as the Small Indian Mongoose (*Herpestes javanicus*), African Green Vervet Monkey (*Cercopithecus aethiops sabaeus*) *Bufo marinus*, Black Rat (*Rattus rattus*), the Norway or Brown Rat (*R. norvegicus*), and the House Mouse (*Mus musculus*). With these introductions followed the extirpations of the Lesser Antillean Iguana (*Iguana delicatissima*), Slippery-back Skink (*Mabuya bistiata*), the Orange-bellied Racer (*Alsophis rufiventris*), and Giant Ditch Frog or Mountain Chicken (*Leptodactylus fallax*), Agouti (*Dasyprocta sp*.), and a native rice or muskrat (*Megalomys* sp.). Additionally, the island's endemic and native flora and agricultural industry have suffered invasions of invertebrate pests such as the Hibiscus mealybug (*Macronellicoccus hirsutus),* Papaya mealybug (*Paracoccus marginatus*), red imported fire ant (*Solenopsis Invicta)*, Brown citrus aphid (*Toxoptera citricidus)*, and the melon thrip (*Thrips palmi)*.

Early detection and control of species invasions are more likely to prove effective and sustainable than remediation measures. Following with Article 8 of the Convention of Biological Diversity, NREI will implement measures to "prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species" (CBD 1992).

In addition to following the SKN port control measures and regulations against pests and invasive species, the Project will implement the following measures to avoid and mitigate possible introductions of invasive flora and fauna:

- Foreign and overseas equipment will be inspected for insect pests, invasive seeds and washed prior to leaving the port;
- Invasive plant species will be removed from areas controlled by the Project. Manual removal will be favored over mechanized or chemical control measures;

- Invasive vegetative and/or seed bearing material that is removed through control measures will be contained and disposed of properly to prevent the distribution of seeds;
- Vehicles and construction equipment will be washed on a regular basis and kept clean to minimize the distribution of seeds and invasive plant material;
- Source areas such as vehicle parking and construction lay down areas will be kept clean of invasive plants to minimize the presence of seeds that can be dispersed unintentionally;
- Disturbed areas will be rehabilitated at the earliest opportunity to minimize the establishment of invasive plant species; and
- Regular and ongoing monitoring of the presence of invasive plant species will be conducted within construction and rehabilitated sites and removal operations implemented according to the results

8.1.5.8 Prevention and Emergency Plan for Unexpected events and accidents

Blowouts are unexpected, rare and dangerous events that can release hot and hazardous geothermal fluids, make noise, damage natural vegetation, and cause injury to wildlife, causing major environmental problems. To avoid disturbance of vegetation, and displacement, injury and mortality to fauna, the Project will implement the Emergency Well Blowout Prevention Plan and emergency shut-in plan as part of the Emergency Response Plan (under a separate cover). These plans include measures to prevent and stop a well blowout, contain, and clean up any fluids that may be released. Spills and releases during shutdowns will be contained within the 1,320,000-gallon (5,000-cubic meter) lined containment pond. Additionally, NREI and contractors will install and regularly inspect the blow out prevention equipment (BOPE) to ensure that the equipment operates and conforms to industry standards.

8.1.5.9 Worker Education and Conduct

To minimize disturbance and harassment to wildlife or extraction and damage to plants, NREI will implement the Workers Health and Safety Management Plan and train workers regarding the importance of limiting interactions for with plants and animals.

The Workers Health and Safety Management Plan establishes Health and Safety instructions and regulations in regards to hunting and harassment, prevention of wildlife vehicle collisions, and safety procedures when finding injured, sick or trapped wildlife. These measures are included in the mitigation measures below.

To mitigate potential impacts of increased access to the Project site and a potential increase in hunting of wildlife, the following management and mitigation measures will be implemented:

- Training and induction on the importance of biodiversity in the region, including:
  - Restrictions and prohibitions on harassment, hunting, trapping, gathering, buying, and/or selling of flora and fauna species (included contractors);
  - Information on species present within the area, especially endangered or threatened species;
  - Procedures regarding how to proceed if alive, injured, or dead animals are found;
  - Delimitation of work areas; and
  - Information regarding appropriate behavior prior to beginning construction.
- Install signs along roads which indicate speed limits;
- Along roads frequently crossed by animals, NREI and its contractors will install wildlife crossing signs within the Project;

- Prohibit the possession of personal firearms or other hunting weapons by personnel and contractors within the Project area; and
- Procedures for flora and fauna incident reporting and follow up.

8.1.6 Roles and Responsibilities

All contractors are required to incorporate these mitigation measures and management controls into their own procedures and work plans. The principal contractors for each Project component (well pads, injection pads, intertie-transmission line, power plant, etc.) and the overall Construction Manager will be responsible for their implementation. NREI's Environmental Coordinator will be responsible for verifying monitoring of mitigation measures implemented.

NREI will ensure that the mitigation measures and controls are implemented and that measurements comply with the standards listed in Section 1.5 of this BMP. This will be achieved through planned periodic inspections, audits of Project sites, and the implementation of monitoring programs. Corrective actions will be developed and implemented when the standards/guidelines listed in Section 1.2 of this BMP are not met. NREI's Project Manager and Environmental Coordinator will be responsible for maintaining records of corrective actions and associated reports. They will also be responsible for supervising the implementation of corrective actions and/or training programs to avoid the repetition of non-conformities and non-compliance with standards.

8.1.7 Summary Table

Table 8-1 presents the impact avoidance, minimization, and mitigation activities that are specific to biodiversity to be implemented during the pre-construction, construction, and operations phases of the Project.

Table 8-1. Summary of Biodiversity Impacts, Mitigation Measures, Timing, Monitoring, KPIs, and Responsibilities

(Exploitation)

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
Clearing of vegetation during construction of Project Infrastructure	Direct loss and disturbance of vegetation, secondary natural forest, and terrestrial wildlife habitat	Minimize	Minimization of Project Footprint	Pre-construction	Documentation of project footprint	Project footprint reduced to 5 acres (2 ha)	NREI/Environmental Coordinator
		Avoid	Avoid removal of trees, where possible, and vegetation along Project boundaries and in undeveloped areas	Construction	Daily vegetation clearing reports	■ Vegetation disturbance is limited to well and injection pad sites	NREI/Environmental Coordinator
		Avoid and Minimize	Minimize impacts by demarcating area of removal to avoid "creep" into surrounding areas and have technical specialist implement best-practice vegetation clearing methods	Construction	Daily vegetation clearing reports	100% of minimization measures are implemented successfully	NREI/Environmental Coordinator and specialized contractor

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
		Avoid and Minimize	Employ an environmental/biodiversity construction monitor during site preparation activities to ensure proper implementation of the measures defined herein, identify potential unforeseen impacts to terrestrial, and to apply adaptive management where needed to minimize impacts on vegetation and wildlife, particularly rare species	Pre-construction	Daily reports documenting the day's activities and findings	Specialist hired with biology/environmental training	NREI
		Restore	Restore and revegetate temporary laydown areas post construction with native trees and shrubs	Post-construction and operations	Revegetation activity reports	100% revegetation of temporary laydown areas with native species	NREI/Environmental Coordinator and specialized contractor
	Mortality, Injury and Disturbance to Fauna	Avoid and minimize	Pre-clearing surveys will deter fauna from Project clearing areas using acoustic deterring methods	Pre-construction	Pre-clearing activity reports and records	■ 100% Implementation of humane wildlife acoustic deterring devices ■ Number of species	NREI/Environmental Coordinator, contracted wildlife specialists

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
						recorded in database	
		Avoid	Conduct bat roost census and implement humane physical or acoustic exclusion measures to keep bats away from site	Pre-construction	Bat roost census reports and records	100% Implementation of humane exclusion measures for existing bat roosts	NREI/Environmental Coordinator and contracted bat specialist
		Avoid and Minimize	Rescue and relocate sessile species to undisturbed sites	Pre-construction	Rescue and relocation records to be prepared for all individuals	■ Identification and successful translocation of sessile fauna from the pad sites prior to site preparation activities ■ No mortality during rescue and relocation	NREI/Environmental Coordinator, contracted wildlife specialists
		Avoid	Avoid vegetation clearing and site preparation activities, as feasible, between April and August to avoid impacts on bird breeding season	Construction	Daily vegetation clearing reports	No nests impacted	NREI/Environmental Coordinator
Vehicular traffic and use of heavy	Direct mortality or injury of wildlife	Avoid	Assess areas for frequent wildlife crossing and install wildlife crossing signs	Construction and Operations	Photographic documentation of signs;	■ 100% of wildlife crossing signs installed along	NREI/Environmental Coordinator

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
machinery along access roads					wildlife-vehicle incident reporting	Project property, if necessary ■ No injury or mortality of wildlife due to Project-related traffic	
		Minimize	Implement Worker Health and Safety Plan in regard to traffic (*i*.e. Install road signs and enforce speed limit)	Construction and Operations	Photographic documentation of signs; wildlife-vehicle incident reporting	■ 100% of road signs installed along Project property	NREI/Environmental Coordinator
	Spread invasive and exotic plant species in temporary laydown areas	Avoid	Regular washing of Project related vehicles and parking areas	Construction	Vehicle and parking area washing logs	100% cleaning and clearing of all invasive species	NREI/Environmental Coordinator
		Avoid and Minimize	Revegetation and restoration of temporary laydown areas with native and endemic species	Operations	Revegetation activity reports	100% revegetation of temporary laydown areas with native species	NREI/Environmental Coordinator
	Traffic and site preparation activities may create dust	Minimize	Regular watering of Project areas	Construction	Documentation of Project footprint through monitoring.	No vegetation degradation from dust accumulation as documented through monitoring.	NREI/Environmental Coordinator

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
Use of equipment from foreign countries	Introduce invasive insect pests and flora that could cause disturbance to natural vegetation species in the BAOI	Avoid	Inspection of all equipment with arrival of overseas equipment following Nevis port regulations	Pre-construction and construction	Inspection reports	100% of inspection of all foreign equipment and supplies	NREI/Environmental Coordinator
Operation of the drill rig, blow testing, and other construction activities	Generated air emissions which could adversely affect susceptible wildlife	Avoid and minimize	Implement air quality management plan and monitor air quality to meet IFC EHS standards	Construction	Air quality monitoring reports	Air quality does not exceed IFC EHS thresholds	NREI/Environmental Coordinator
	High Noise levels causing wildlife displacement and mask acoustic calling, thus affecting mating and feeding behaviors,	Minimize	Install temporary sound barriers, if construction is not during hurricane season	Construction	Photographic documentation; pre-drilling preparation reports	NA	NREI/Environmental Coordinator
		Minimize	Maintain vegetation barriers surrounding Project Area	Construction	Vegetation clearing daily reports	Vegetation disturbance is limited to well and injection pad sites	NREI/Environmental Coordinator
		Minimize	Provide regular maintenance to all vehicles and Install	Construction and Operation	Maintenance and	Vehicle noise does not cause exceedance of IFC	NREI/Environmental Coordinator

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
	within the BAOI		silencers to vehicles and heavy equipment		inspection logs	EHS noise thresholds	
		Avoid	Avoid drilling and steam blow testing, as feasible, between April and August to avoid impacts on maternity colonies of bats, and bird breeding season	Construction	Scheduled construction timeline;	No abandonment of breeding territories in and around the Project	NREI/Environmental Coordinator
		Avoid and Minimize	Survey areas for existing bat roosts and implement humane physical or acoustic exclusion measures to keep bats away from site	Pre-construction	Bat survey census reports and records	100% of roosts are cleared prior to construction, if found within Project boundaries	NREI/Environmental Coordinator and contracted bat specialist
	Generation of localized vibrations sufficient to harm ground-dwelling terrestrial wildlife.	Minimize	Assess the need of a shock absorber, or damper on the drill	Construction	NA	Vibration ground disturbance is monitored	NREI/Environmental Coordinator, drilling contractor
		Minimize	Sequence drilling operations so that the vibration-intensive activities do not occur simultaneously	Construction	Scheduled drilling timeline	Drilling timeline is schedule to reduce overlap of drilling activities, as feasible	NREI/Environmental Coordinator, Drilling contractor
		Avoid/Minimize	Implement pre-construction surveys to relocate ground dwelling wildlife from the activity sites to the extent practicable	Pre-construction	Pre-clearing activity reports and records; Rescue and	■ Identification and successful translocation of sessile ground fauna from the pad sites prior	NREI/Environmental Coordinator

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
					relocation records	to site preparation activities ■ No mortality during rescue and relocation	
Operation of air cooler condenser fans	High Noise levels causing wildlife displacement and mask acoustic calling adjacent to the Project	Minimize	Minimize noise levels from air fans with the use of Exergy fans as opposed to Turboden condensers	Construction	Photographic documentation	Use of Exergy fans	NREI/Environmental Coordinator
		Minimize	Adjust air-cooled condenser units speed drives to reduce noise if necessary;	Operations	Operations noise monitoring logs	Operations noise is monitored and speeds are adjusted, if necessary	NREI/Environmental Coordinator
		Minimize	Minimize noise levels at night (10 PM to 7 AM) by reducing operating air condenser fans from 24 to 12	Operations	Daily operations logs	Noise from operations is minimized at night	NREI/Environmental Coordinator
		Minimize	Maintain and plant dense vegetation near air cooler condensers.	Operations	Vegetation clearing and revegetation activity reports	Vegetation disturbance is reduced to well and injection pad sites	NREI/Environmental Coordinator
Artificial Night lighting during	Introduced artificial night lighting	Minimize	Assess and design light intensity and configuration, spacing, height, and	Pre-construction	NA	No impacts to birds and bats due to artificial light night	NREI/Environmental Coordinator

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
construction and operations	could act as attractants for night-migrating or nocturnal species, increasing the potential for collision with lighting structures, increased energy expenditure, or increased predation		directionality to reduce the intensity and spillage of light to minimize overall illumination				
		Minimize	Minimize the amount of artificial lighting used at the pad sites with the following: ■ Use directional lighting (downward facing lighting) and direction accessories ■ Avoid the use of UV light	Pre-construction	Lighting design	■ Assessment of all lighting structures and areas ■ Demonstrated reduction of impacts for nocturnal fauna, including bats, birds and mortality to insects.	NREI/Environmental Coordinator
Installation of a permanent 5,000 m^3 brine pond	Holding of geothermal fluids may cause injury or mortality to terrestrial wildlife	Avoid	Installation of screen or nets over the brine collection pond to prevent wildlife contact with fluids	Construction and Operations	Photographic documentation	No mortality or injury to fauna associated with brine pond	NREI/Environmental Coordinator
Worker harassment	Disturbance, injury and mortality to fauna and flora	Avoid/Minimize	Provide training to Project field staff on the biodiversity features of the Project area, particularly the rare and	Worker Induction, and pre-construction	Documentation of Training provided to	100% of workers trained	NREI/Environmental Coordinator

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
			endemic species potentially present in the area, wildlife management, and the procedures defined in this Biodiversity Management Plan		Staff, provision of written training materials, and attendance records		
		Avoid/Minimize	Implement Worker Health and Safety Plan which prohibits wildlife hunting activities, poaching, or any form of harassment	Worker Induction, and pre-construction	Documentation of induction training provided to staff	100% worker attendance of trainings and safety inductions	NREI/Environmental Coordinator
		Avoid/Minimize	Installation of no disturbance, no hunting or harassment of wildlife signs in work areas	Pre-construction	Photographic documentation	Signs installed in frequently viewed areas	NREI/Environmental Coordinator
Geothermal well blowout and other unforeseen emergency events	Disturbance, injury and mortality of nearby rare and endemic fauna and flora	Avoid/Minimize	Installation of blowout prevention equipment (BOPE) and regularly inspect the BOPE to ensure that the equipment operates and conforms to industry standards	Construction and Operations	Photographic documentation; maintenance and inspection records/logs	Regular inspections	NREI/Environmental Coordinator
		Avoid/Minimize	Implement the emergency Well Blowout Prevention Plan and Emergency	Construction and Operations	Documentation of prevention and	100% implementation of prevention and	NREI/Environmental Coordinator

Source of Impact	Impact	Mitigation hierarchy	Mitigation Measure	Timing	Monitoring	KPI	Responsibility
			shut-in plan to contain and clean up any fluids that may be released		emergency training provided to staff	training on emergency plan	
		Avoid/Minimize	Install fences around immediate well pads	Construction and Operations	Photographic documentation	No incidence of wildlife within well or injection pads	NREI/Environmental Coordinator

8.2 Erosion and Sediment Control Plan (Exploration and Exploitation Phases)

8.2.1 Introduction

The Erosion and Sediment Control Plan has the purpose of ensuring the reduction of the project's potential impacts on the soils and the water resources in its area of influence, as well as documenting and monitoring the mitigation measures that will be implemented. The plan includes methods that will guide the personnel involved in the project to manage, mitigate and / or avoid (as much as possible) adverse effects with regards to soils. In general, erosion and sediment control is part of the design for construction activities that the contractor must prepare for any project.

8.2.1.1 Objective

They key objective of this Plan is to ensure that the effects of erosion and sedimentation on the environment are minimized by minimizing soil disturbance, degradation and erosion resulting from Project activities. The more general objectives of this plan include:

- Comply with the relevant country regulatory requirements;
- Avoid and control soil erosion and contamination;
- Follow best international practices guidelines;
- Define the procedures, integrated controls and mitigation measures to be used in construction activities and project operation phases that have the potential to cause adverse impacts;
- Define the roles and responsibilities for the implementation of this Plan; and
- Define procedures for monitoring the efficiency of the mitigation measures, the generation of reports, interventions, and the adaptation of the plan.

8.2.1.2 Scope of Application

This procedure will apply during the development of NREI's activities and during the Project's life cycle (construction, operations and decommissioning). It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's Environmental and Social Management Plan (ESMP) policies and procedures, which are aligned to international best practices.

The Erosion and Sediment Control plan includes measures to ensure that direct impacts (land disturbance) are limited to the works area, and that secondary impacts do not impact adjacent areas. This plan shall be distributed to all contractors / subcontractors, and it shall be included in all contractual documentation or as a contract amendment, if the Company was contracted before the creation of the ESMP, and used as a basis for all specific Erosion and Sediment Control Plans to be prepared by all engaged parties. Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.2.2 Roles and Responsibilities

In order to properly implement the Erosion and Sediment Control Plan, NREI requires the involvement of the people listed below.

Table 8-2: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Erosion and Sediment Control Plan
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Erosion and Sediment Control Plan
Head of ESG	■ Assure the correct implementation of the Erosion and Sediment Control Plan
ESG Manager	■ Assure the correct implementation of the Erosion and Sediment Control Plan Update the Erosion and Sediment Control Plan ■ Review and approve the contractor project-specific Erosion and Sediment Control Plan
Environmental Coordinator or H&S Manager	■ Ensure the generation of evidence and reports for compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Erosion and Sediment Control Plan
Contractor Company	■ Develop a project-specific Erosion and Sediment Control Plan
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Erosion and Sediment Control Plan

Source: NREI, 2020

8.2.2.1 Construction

Contractors are required to incorporate proposed mitigation measures and management controls in their own procedures and work plans, and in the Management Plans for each project. Their roles and responsibilities with regards to monitoring and implementation of mitigation measures will be clearly defined in these plans.

8.2.2.2 Operation

Monitoring of the condition of stormwater management structures will be performed during the routine site inspections to be performed by the Plant Managers. Any corrective actions will be implemented by the site General Maintenance personnel.

8.2.3 Key Impacts

the Earth movement activities during construction can lead to erosion and sedimentation which can have the following impacts:

- Airborne dust
- Damage to native plants
- Pollution to local waterways and harm to aquatic animals within the local waterways
- Increase in flooding conditions.

Construction activities at the site include:

- Site clearing for drilling pads, plant infrastructure, and transmission lines
- Movement of heavy equipment
- Construction of infrastructure

- Installation of transmission lines

Once sites have been restored and/or rehabilitated, no erosion or sedimentation is expected during operational activities.

8.2.4 Mitigation Measures

8.2.4.1 Pre-Construction

During the design stage, erosion and sediment control measures will be included in the Project design to control runoff from construction areas. These designs will include temporary (for construction) as well permanent drainage systems (construction and operation), and will include gulleys and stormwater conveyance systems with gentle slopes with the purpose of diverting stormwater away from the project infrastructure in a manner which does not cause soil erosion or sedimentation. Deforestation and site clearance activities will be minimized to the extent possible.

8.2.4.2 Construction

In order to reduce erosion and sedimentation during Construction, mitigation measures to be applied include:

- Disturbance area will be minimized and clearly demarcated.
- Works will only be conducted within the works zone.
- Vehicle movements will be restricted to the defined roads/tracks.
- Where possible, works area will be designed to ensure stormwater runoff drains into the site.
- Where runoff from the site is required, it will be via the longest flow path possible to ensure maximum sediment retention. Flows to undisturbed areas will be prioritized.
- Where required, sediment controls will be put in place. These will include, but not be limited to, sediment ditches, regulating dams such as rock check dams, sediment basins, sediment fences and silt socks.
- Develop banks and excavation slopes in accordance with the guidelines for geotechnical stability. All soil stockpiles that will not be immediately re-used will be seeded. Temporary stockpiles will be watered as required to suppress dust.
- Avoid building roads or access roads on slopes greater than 15% as a soil conservation measure.
- Deposit surplus material in previously approved areas or reuse it as fill material.
- Stabilization and progressive reforestation of affected areas with plants and vegetation native to the island.

Once the construction stage is complete, all areas, including access and service roads, which are not necessary for the project's operation will be restored to their original or better conditions.

8.2.4.3 Operation

During operation, stormwater conveyance systems will be adequately maintained in order to ensure stormwater flow does not lead to erosion and sedimentation. Stormwater collected in secondary storage facilities will be discharged once it has been inspected for contamination, at low flow rates through the existing stormwater conveyance systems to allow for infiltration into the ground at the site. If any signs of oil sheen or contamination are observed in the collected stormwater, then it shall be handled in accordance with the Waste Management Plan.

8.2.5 Monitoring and Reporting

Each construction Contractor will establish an inspection and audit program that will include:

- Identification of performance indicators to be monitored
- Periodic audits and inspections of the contractors' work front to verify the correct implementation of the erosion and sediment control measures and plans, as well as the installation of erosion control systems.
- Inspections (periodic and unannounced) of clearing activities (felling and pruning).

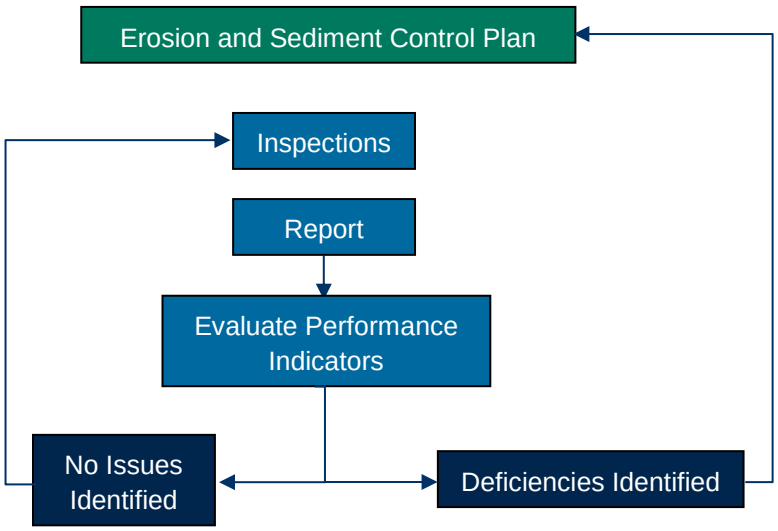
Monitoring during construction activities will be a constant occurrence, with daily visual inspections of work site. Sediment controls will be reviewed during site inspections and/or after significant rainfall (more than 10mm in 24hrs resulting in site runoff).

If erosion or sedimentation resultant of the construction activities taking place is observed during the site inspections, an incident report for non-conformance of sediment control will prepared. In addition, during week like site inspections, the location and condition of sediment control structures will be recorded.

If necessary, corrective actions will be carried out which will:

- Investigate cause of sediment control failure.
- Review flow path and determine most appropriate controls are in place, additional controls which can be place in-stream and/or changes that can be made to flow path
- Review similar controls on-site (even though these may not have failed) for similarities.

Figure 8-1: Erosion and Sediment Control Audit Flow Diagram



8.2.6 Training

All personnel will be trained on:

- General awareness and procedures concerning water management and the prevention of erosion and sedimentation;
- General awareness on key indicators of erosion and sedimentation in order to apply corrective actions;

- The appropriate disposal methods of collected stormwater.

8.2.7 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-3: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method / Tool / Frequency
Soil and Water Resources	No evidence of significant sediment deposition outside the works area.	100% of inspections	Construction	Site inspections, Weekly and after rain events
Soil and Water Resources	No evidence of significant rilling, gullies or other instances of run-off erosion.	100%	Construction and Operation	Site inspections, Construction: Weekly and after rain events, Operation: Monthly and after major rain events.
Soil and Water Resources	Employees must have the appropriate training	100%	Construction and Operation	Documentation verification. Construction: Induction training, Operation: Yearly

8.3 Waste Management Plan (Exploration and Exploitation Phases)

8.3.1 Introduction

Nevis Renewable Energy International, Inc. (NREI) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plan (ESMP) policies and procedures.

To promote the Project's alignment to best international practices, NREI acknowledges that waste management measures are an essential part of any project. This Waste Management Plan details the steps to minimize environmental impacts through appropriate controls and site inductions of employees and sub-contractors. During the construction and operation phase of the Project, there is the possibility of generating solid, liquid, and hazardous wastes. This plan defines the various potential sources of waste, and sets out how they will be controlled and monitored for the duration of the projects.

8.3.1.1 Objective

The objective of this plan is to comply with all relevant host-country environmental regulations, reduce waste volume, maximize recycling, reuse and recovery, and prevent any construction waste/litter entering the environment. In general, the objectives of this plan include:

- Avoid and control the generation of waste related to the Project during the construction and operation phases;
- Define the procedures, integrated controls and mitigation measures to be used during the activities from the construction and operation phases that have the potential to affect the environment and the neighboring communities; and
- Comply with the requirements of the host country regarding the management and disposal of different types of waste.

8.3.1.2 Scope of Application

This procedure will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

The Waste Management Plan includes measures related to the management of waste derived from Project activities. This plan shall be distributed to all contractors / subcontractors, and it shall be included in all contractual documentation and used as a basis for all specific \Waste Management Plans to be prepared by all engaged parties. Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.3.2 Roles and Responsibilities

In order to properly implement the Waste Management Plan, NREI requires the involvement of the people listed below.

Table 8-4: Roles and Responsibilities

Role	Responsibilities

CEO	■ Be familiarized, review and approve the Waste Management Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Waste Management Plan
Head of ESG	■ Assure the correct implementation of the Waste Management Plan
ESG Manager	■ Assure the correct implementation of the Waste Management Plan ■ Update the Waste Management Plan ■ Review and approve the contractor project-specific waste management plan.
Environmental Coordinator or H&S Manager	■ Ensure the generation of evidence and reports for national compliance and compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Waste Management Plan
Contractor Company	■ Develop a project-specific Waste Management Plan
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Waste Management Plan

Source: NREI, 2020

Typical roles and responsibilities are as follows:

- As project phases unfold, Contractors will be responsible for overseeing the implementation of the waste management plan. Contractors must develop and deliver a list of all waste management procedures, specific to each function.
- Prior to the start of work involving the generation of waste, each Contractor must prepare its own management plans and inspection procedures. Said management plans will be reviewed and approved by the NREI before the works begin, in order to ensure consistency between the waste management plans. In addition, Contractors will need to comply with all local rules and regulations including the correct classification, disposal and reuse of waste.
- Workplace supervisors will oversee health and safety factors for Contractors in relation to waste management and enforce established environmental incident prevention and safety practices. They will supervise waste activities comprised of classification, control, mitigation, transportation and disposal of all the waste generated by the projects

8.3.3 Sources of Impacts

Most of the waste is expected during construction activities. The construction of the Project will generate typical industrial construction waste as well as typical household waste. During operation, personnel at the administration and control building, and the security building will generate typical office and household wastes.

If not properly managed, the potential impacts associated with the waste include:

- Visual impacts in the areas of the construction works;
- Contamination of soils and water resources;
- Impacts on animals;
- Impacts on human health;
- Odors from residues in surrounding areas; and
- Waste due to poor management of recyclable waste.

8.3.4 Waste Generation

A number of wastes generated during the construction and drilling activities will be transported off-site for disposal. These wastes will be recycled or re-used if possible or transported and disposed of at an appropriate licensed municipal landfill facility or at an alternative approved site.

Where practicable, the following waste types will be recycled or reused:

- Recyclable waste materials such as paper, plastic, wood and glass;
- Scrap metal and other material; and
- Used oil, including lubricating and gear oil; solvents; hydrocarbon based detergents, possible drilling fluids and machine oil.

A licensed waste contractor at licensed waste facilities will dispose of the following wastes:

- Drums and containers containing residues (e.g. lubricating oil) that may have environmental effects; and
- Hazardous wastes.

8.3.5 Approach

The Project will comply with national laws and standards, as well as with the best international practices for waste management. It is important to minimize the generation and transportation of waste to disposal facilities. The general approach to waste management is described below:

- **Reduction:** Whenever possible, waste generation will be minimized, not only to save money but also to reduce the need for storage and transportation resources, and to promote sustainable work environments. During the construction phase of the projects, the contractors and operators of the construction works will be required to supply specific waste reduction plans and procedures. Workers and operating companies will avoid the excessive use of materials in their work activities. During the operation phase of projects, operators, those responsible for maintenance, and users will work in a sustainable way and encourage members of the surrounding communities to do the same.
- **Reuse:** it is expected that during the construction and operation phases of the projects multiple types of waste will be generated. When possible, all waste material that is salvageable and practical will be reused.
- **Recycling:** Recycling not only reduces the volume of waste, it also protects wildlife, reduces water pollution, creates jobs, and encourages sustainable behavior. When possible, the following items will be recycled: plastics, cans, glass, paper, cardboard, wood and metal. All recycling items will be collected, sorted and stored at the point of origin and placed in different containers or containers clearly identified with markings and colors. After sorting, items will be transported to pre-approved recycling centers.
- **Classification:** all waste materials (hazardous and non-hazardous) will be classified at the point of origin in separate areas for each type of waste. Materials that can be reused or recycled will be separated in additional locations or containers to minimize transportation and disposal of waste. Examples of acceptable materials for recycling were listed above. Hazardous and non-hazardous waste will be monitored and managed separately. Wastes can be classified in the following classifications:

- General Waste: Waste must be considered as general waste when it does not have the characteristics to be classified as special handling waste or it does not have any specification included in the local regulation.

- Special Handling Waste: The waste that is required to have special handle during its disposal process and is not classified as hazardous waste must be considered as special handling waste.

- Hazardous Waste: The waste that have any danger specification or characteristics according to the local regulation, it must be consider as hazardous waste.

- **Disposal Transportation:** Waste materials that cannot be reused, recycled, or salvaged will be taken to a previously designated landfill and waste management facilities. Such facilities must meet and comply with all relevant regulations; as established by local laws. Contractors will document and record all transportation of waste, which will include information such as: type of waste, quantity, source of the waste, location of disposal site, and receiving facilities.

Household waste, such as garbage (bottles, cans, clothing, compost, disposable items, food packaging, food waste, newspapers, magazines, etc.) will be classified at the point of origin, placed in containers of different colors (supplied by contractors) and clearly identified, for example:

- Blue: plastic items;
- Green: cans and glassware;
- Red: residual waste;
- White: paper and cardboard; and
- Brown: food waste.

Industrial waste generated during the construction, operation and decommissioning phases of projects shall be classified at the point of origin in piles or in properly identified steel bins. Examples of the types of industrial solid and liquid wastes expected include:

- Drilling muds;
- Metal waste;
- Plastics;
- Concrete;
- Wood waste;
- Oil-contaminated rags;
- Cardboard;
- Used oils and fats;
- Batteries;
- Paint containers; and
- Residues of chemical compounds (paints, adhesive materials, etc.)

8.3.6 Management Measures

8.3.6.1 Non-Hazardous Waste

Contractors will be responsible for directing and implementing the solid, liquid, and hazardous waste management plan. It will be required for all of the main contractors of the construction and operation phases of the projects to develop their own waste management plans, specific to each activity, that demonstrate compliance with the following (as a minimum):

- Measures to prevent waste generation or to reduce them to the minimum;
- Mechanisms for the collection, identification, temporary storage, and transportation of the waste before its transfer outside the Project areas;
- Responsible parties;
- Measures for the reuse of waste;
- Options for recycling, treatment and disposal of waste, including the proposed final destinations of those that cannot be reused;
- Procedures for registering and documentation of waste transfers;
- Specific management measures for hazardous waste;
- Regulatory requirements and classification;
- Expected types and estimation of waste volumes; and
- Trainings for staff awareness.

Project contractors will use companies approved by the Government to ensure that the transportation, treatment and/or disposal of waste are done correctly, and will implement the following controls:

- Provide appropriate waste bins, type, volume, and service frequency to accommodate anticipated waste streams.
- All loads arriving or leaving the site will be appropriately secured.
- Provide information regarding waste management in site-specific inductions, including waste separation and importance of securing vehicle loads.
- Ensure licensed contractors are used to collect controlled wastes.
- Sewage and other effluents generated must be discharged to the septic tanks

All drilling related waste material will be disposed offsite at the local landfill. No onsite disposal of any waste material is allowed.

8.3.6.2 Hazardous Waste

The local landfill does not allow hazardous waste material disposal; therefore, any characteristic or listed hazardous waste produced by the contractors will be containerized appropriately and shipped to Trinidad for appropriate handling and disposal. If controlled substances need to be shipped off the island, then international regulations must be followed.

NREI will include contractual clauses that describe the requirements for transportation and disposal instructions so that they are handled appropriately and implement a “cradle-to-grave” approach where documentation for accountability is maintained from removal all the way to final disposal (noting quantities, types of materials, and names of people and companies handling the material).

8.3.7 Documentation and Monitoring

Monitoring and "cradle-to-grave" documentation of the generation, transportation, and disposal of waste materials is essential to projects. Measures and standards must be implemented to ensure compliance and to detect non-conformities with said standards. When a nonconformity is detected, a formal investigation will be conducted to determine its origin and establish the necessary corrective actions to comply with the standards.

Contractors will carry out daily inspections, audits, monitoring and sampling activities (if necessary) in all areas associated with the generation and reception of waste. Additionally, contractors will keep logs of waste volumes leaving the site with contractors. Checklists will be prepared for use during the inspections, which will be documented for reporting and monitoring purposes.

Inspection lists will include:

- Any spill, leak, absence of identification markings, containment problems and any other factor that may require corrective actions; and
- Records and documentation of any corrective and follow-up action on issues identified.
- Additionally, inspections of all buildings related to the facilities will be carried out in order to establish their current conditions and maintenance, cleanliness and order, the contractor's performance, the classification process, and the assessment of additional processing areas.

Any environmental incident involving wastes generated on site will be documented via an incident report. Corrective actions will include:

- Investigate cause of inappropriate waste disposal.
- Review cause of issue and develop response, such as variation to bin size, service schedule or waste separation awareness.
- Implement controls.

8.3.8 Training

Before the start of the construction works for each project, all project personnel must have received specific training for their tasks, as well as participated in various induction training sessions. Employees and contractors will be provided detailed information about the importance of proper waste management, including its classification.

8.3.9 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-5: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Soil and Water Resources - Accidental release of hazardous materials into the environment during transportation and/or storage. Inappropriate disposal of hazardous materials.	Hazardous materials all appropriately disposed	100%	Construction and Operation	Monthly Inspections, Documentation verification.

Soil and Water Resources	Waste materials appropriately disposed at landfill	100%	Construction and Operation	Monthly Inspections, Documentation verification.
Soil and Water Resources	Recycling of all recyclable construction waste	100%	Construction and Operation	Montyhly Inspections, Documentation verification.
Soil and Water Resources	Waste Records maintained on site	100%	Construction and Operation	Monthly Inspections, Documentation verification.
Soil and Water Resources	Employees must have the appropriate training	100%	Construction and Operation	Documentation verification. Construction: Induction training, Operation: Yearly
Soil and Water Resources	% Waste reduction (all types)	Any % reduction	Operation	Documentation, monthly calculations
Soil and Water Resources	Increase in % recycled waste	Any % increase	Operation	Documentation, monthly calculations
Soil and Water Resources	100% Compliance with waste storage areas inspections	100%	Construction and Operation	Monthly Inspections
Soil and Water Resources	100% Compliance with local applicable permits and authorizations	100%	Construction and Operation	Documentation verification

8.4 Water Management Plan (Exploration and Exploitation Phases)

8.4.1 Introduction

Nevis Renewable Energy International, Inc. (NREI) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plan (ESMP) policies and procedures.

To promote the Project's alignment to best international practices, NREI acknowledges that water management measures are an essential part of any project. This Water Management Plan details the steps to follow for the identification and the appropriate management of potential impacts to the water resources in the Projects AOI, including the necessary requirement for the water supply and wastewater discharged during activities associated with the geothermal Project.

8.4.1.1 Objective

The objective of this plan is to comply with all relevant host-country environmental regulations, identify project risks on water resources and provide appropriate mitigation. In general, the objectives of this plan include:

- Protect surface and groundwater quantity and quality for local users and the environment
- Define management procedures for all water-related functions including roles and responsibilities and training requirements;
- Comply with applicable regulatory requirements and recommended international guidelines (i.e., WHO, IFC, NOAA);
- Align with international best practices; and
- Define and implement monitoring and reporting procedures

In addition, identify project activities that require water consumption and minimize and monitor water usage, document the water sources, which must be authorized by local entities; and monitor wastewater discharge for compliance with the host country's Maximum Permissible Limits (MPL).

Stormwater that accumulates in secondary containment areas will be discharged in a way that does not lead to negative impacts and in accordance with the Erosion and Sediment Control Plan. Geothermal fluids extracted from the reservoir will be in closed loop system that will be re-injected into the reservoir and will not be used for any other purpose or released to the environment. Brine ponds have been designed to be able to hold enough geothermal fluids during plant shut-down activities or emergency response. Any geothermal fluids collected in the brine ponds will also be re-injected into the reservoirs.

8.4.1.2 Scope of Application

This procedure will apply during the development of NREI's activities and during the Project's life cycle (construction, operations and decommissioning). It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

The Water Management Plan includes measures related to the management of water and wastewater related to Project activities. This plan shall be distributed to all contractors / subcontractors, and it shall be

included in all contractual documentation and used as a basis for all specific Water Management Plans to be prepared by all engaged parties. Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.4.2 Roles and Responsibilities

In order to properly implement the Water Management Plan, NREI requires the involvement of the people listed below.

Table 8-6: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Water Management Plan
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Water Management Plan
Head of ESG	■ Assure the correct implementation of the Water Management Plan
ESG Manager	■ Assure the correct implementation of the Water Management Plan ■ Update the Water Management Plan ■ Review and approve the contractor project-specific Water Management Plan
Environmental Coordinator or H&S Manager	■ Ensure the generation of evidence and reports for compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Water Management Plan
Contractor Company	■ Develop a project-specific Waste Management Plan
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Water Management Plan

Source: NREI, 2020

Typical roles and responsibilities are as follows:

Plant Manager:

- Accountable for ensuring the right resources are available to manage water use and wastewater within the plant and deliver on procedure objectives.
- Responsible for approving corrective actions to address issues associated with water use and management with a focus on reducing consumptive use, and wastewater discharge.
- Responsible for ensuring that water use, management, and wastewater discharge are compliant with the applicable regulatory requirements and IFC standards.
- Responsible for appointing a competent person (Engineer or equivalent) to monitor and manage water use within the plant.
- Responsible for working with Engineers to agree follow up action to address water use and any water leakage issues identified by the Engineer.
- Responsible for identifying water minimization opportunities such as equipment changes.
- Responsible for identifying opportunities for reducing the pollution loading on wastewater discharges.

Environmental Coordinator or H&S Manager/Engineer:

- Responsible for regular water management and usage monitoring, including analyzing the data to identify trends in water use (e.g. is water use in summer significantly higher due to raised air temperatures) and reporting results to the Plant Manager.
- Responsible for meeting maintenance schedules for the septic system and any associated equipment.
- Responsible for recommending, submitting to, and coordinating with the Plant Manager any identified changes/upgrades in response to any issues identified by the water usage survey program.
- Responsible for identifying and responding to increased water use and water leakage, working with the Plant Manager.
- Responsible for reviewing changes to the equipment that might require change management procedures and investigation.
- Responsible for engaging suitably competent persons and contractors to undertake work to rectifying any leaks or other water and wastewater associated faults or maintenance.

Contractor Companies:

- Develop a project-specific Water Management Procedure aligned with this Water Management Plan.

Employees, Contractors and Subcontractors:

- Understand and carry out the activities set out in this Water Management Plan.

8.4.3 Activities

Most of the water use is expected during construction activities. The construction of the Project will require water during well drilling and filling the firewater tank, and for the portable worker restrooms. During operation, utility water will be required for the administration and control building, and the security building.

Most of the wastewater generated on-site will be sanitary sewage resulting from the portable restroom facilities during construction and from the restrooms and kitchens in the administration and control building, and the security building during operation.

8.4.4 Water

Construction

Facility and Site Construction

During construction activities, potable water for contractor use will be trucked onsite. No maintenance activities shall be performed on site. Vehicle and equipment washing on-site will be prohibited. In addition, the contractor must:

- Properly store and use of fuel and hazard materials so that they do not come into contact with water;
- Control soil erosion in construction areas (by use of hay bales and silt fences);
- Monitor and periodically remove accumulated silt from any sediment control ponds for proper disposal (landfill);

- Construct diversion drains and bunds to divert clean runoff away from construction areas and prevent contaminated water entering local water sources.

Well Drilling

1. Drilling Muds

Drilling will be conducted using water-based drilling muds rather than oil based. Drill cuttings will flow into a temporary mud pit where drill cuttings are settled prior to the mud being recirculated back into the borehole. During short-term well testing, the mud is evacuated from the borehole into the temporary mud pits. Settled solids will be disposed of at the landfill while liquids will be re-injected into the reservoir. Once the storage ponds area available, fluid produced during testing activities will be directed into the 5,000 m^3 storage pond prior to re-injection. During long term testing, when an injection well is then available, the produced fluid will be immediately re-injected via the injection wells. In order to prevent contamination of the drilling fluids, the contractor will:

- Recycle drilling muds where possible;
- Design adequate capacity ponds to manage wastewater;
- Line ponds with HDPE/impermeable lining, and regularly check for rips and tears. Ponds will be regularly cleared of silt;
- Lining, casing and grouting the drilling wells;
- Reinjection of water (geothermal fluids) to avoid discharge of well brines to surface water
- Route effluent fluids to settling ponds; and
- Create bunded areas in low-lying land around injection pads and provide diversion channels around these bunded areas.

2. Measurement of Water Intake

Up to 10,000 gallons of water a day will be used for drilling, to be stored in a 65 m3 capacity tank at the well pads. During drilling activities, the contractor will measure the amount of water supplied and discharged. This information must be registered with the additional information described below:

- Description of the activity where water is consumed;
- The maximum permissible amount or the local equivalent of water discharged established by the internationally accepted regulatory organisms;
- Monthly amount of water consumed and discharged

In addition, the contractor must manage the potential circumstances where water is consumed or discharged (i.e. consumption reduction plans or strategies), and mitigate the potential water discharges by applying measures to control and reduce them.

3. Groundwater

Other than the geothermal fluid to be used for the plant, there will be no other use of groundwater at the facility. Wells will be designed to employ deep set surface casing to prevent blowouts (the uncontrolled discharge of deep aquifer water/steam into the upper aquifer or surface).

Operation

Measurement of Water Intake

A water meter will be installed at the intake from the main prior to the water entering the facility. This water meter measures and records the inlet water flow rate and calculates the total cumulative water flow/volumes. The measurement is continuous and data are recorded on a continuous basis.

Water Use Monitoring

The water usage for the plant as a whole is calculated at least monthly based on the volumes of water abstracted from the local water main.

Consumption values are compared to design calculations as well as previously recorded consumption values for those same operating conditions and the source(s) of any net loss/gain identified. Changes in consumption are accounted for to allow opportunities to identify leaks as well as to reduce consumptive use.

Recording of Leaks/ Opportunities to Reduce Consumptive Use

By the implementation of a regular water monitoring program as well as facility inspections by the Engineers as part of relevant operational and maintenance procedures, significant leaks are identified and recorded, including their location, duration and approximate volumes of water lost. The Engineers also record corrective actions/nature of repairs undertaken. Opportunities for reduction in consumptive water use are identified by the Environmental Department where possible and as part of annual environmental improvement initiatives.

8.4.4.2 Wastewater

Construction

Sanitary Sewage

Sanitation facilities for the contractors will be provided via portable-self-contained facilities. Waste from these facilities will be disposed of at the local landfill off-site. No wastewater will be treated or disposed of on-site.

Drilling

Drilling and injection works have the potential to affect water resources quality if geothermal liquid, wash water, mud and drill cuttings (collectively referred to as process wastewater) are not managed properly. Process wastewater resulting from the drilling will be re-injected into the reservoir once solids have been settled out in the sump pumps. Drilling muds will be disposed of at the local landfill. No onsite disposal of any waste material is allowed. No hazardous waste material is allowed to be disposed of at the local landfill. Any characteristic or listed hazardous waste produced by the drilling contractor will be containerized and shipped back to their headquarters in Trinidad for appropriate handling and disposal.

Prohibitions

Any illicit discharges of industrial wastewater or chemicals/hazardous materials into the portable sanitary facilities is strictly prohibited. Equipment and vehicle washing is not allowed to be performed on-site.

Operation

Septic System

Septic systems will be installed onsite for treatment of sanitary sewage. This septic system will be:

- Properly designed and installed in accordance with local regulations and guidance to prevent any hazard to public health or contamination of land, surface or groundwater.
- Well maintained to allow effective operation.
- Installed in an area with sufficient soil percolation for the design wastewater-loading rate.
- Installed in an area of stable soils that are nearly level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters.

Prohibitions

Any illicit discharges of industrial wastewater or chemicals/hazardous materials into the sanitary sewer system is strictly prohibited.

Maintenance

The facility's septic system will have to be operated, cleaned and maintained by a licensed contractor based on the schedule recommended by the manufacturer. There are no wastewater treatment facilities available on the Island, therefore pumped solids will be disposed of at the designated area of the landfill.

8.4.4.3 Stormwater

Construction

Stormwater will be diverted from the construction areas in accordance with the Erosion and Sediment Control Plan in order to avoid stormwater coming in contact with exposed soils or construction equipment. Stormwater collected in secondary containment areas will be checked for oil sheens and any signs of contamination before being discharged to the surrounding surface to allow for infiltration into the ground.

If there are signs of contamination, the stormwater will be pumped out of the secondary containment areas and collected, transported, treated or sent to disposal in compliance with the federal, state or municipal regulations.

Operation

Stormwater collected in secondary containment areas will be checked for oil sheens and any signs of contamination before being discharged to the surrounding surface to allow for infiltration into the ground.

If there are signs of contamination, the stormwater will be pumped out of the secondary containment areas and collected, transported, treated or sent to disposal in compliance with the federal, state or municipal regulations.

8.4.5 Documentation and Monitoring

Implementation of this procedure is reviewed through internal and external (when applicable and available) audit results and other inspection processes.

8.4.5.1 Construction

During drilling activities, there will be daily site inspections and audit reports which shall be kept on-file. There will be no discharges of untreated water. Prepare Daily Geological Reports (DGR) which include a description of the cuttings. In the event that there is a discharge of untreated water or drilling muds, an incident report will be filled.

As indicated above, measurements of water intakes will be performed and documents will be maintained on-site. Waste logs will also be maintained on-site.

8.4.5.2 Operation

Monthly reports on water usage will be maintained on-site to monitor water usage. Maintenance and inspection logs will be maintained on-site.

Any permits relating to water supply will be maintained on site indefinitely.

Any wastewater resulting from industrial activities onsite will have to be disposed of off-site. Maintenance logs for the septic system will have to be maintained on site indefinitely.

8.4.6 Training

All activities will consider the reduction and adequate management of water consumption. All personnel will be trained on:

- General awareness and procedures concerning water management and conservation
- Emergency procedures in case of water leaks
- The appropriate disposal methods of hazardous materials or industrial wastewater to ensure they are not disposed of in the facility's sanitary sewer system.

8.4.7 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-7: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Water Resources	% Water consumption		Construction and Operation	Record quantity of water consumed and timing of consumption Construction: Daily Operation: Monthly
Water Resources	% Water savings		Construction and Operation	Record quantity of water consumed and timing of consumption Construction: Daily Operation: Monthly
Soil and Water Resources	Daily Drilling Report (DDR) and Daily Geology Reports (DGR)		Construction	Record Daily

Water Resources	Monthly surface water quality monitoring upstream and downstream of the Project sites – no deterioration in pre-project water quality		Construction	Monthly water quality monitoring
Soil and Water Resources	Employees must have the appropriate training	100%	Construction and Operation	Documentation verification. Construction: Induction training, Operation: Yearly

8.5 Air Emissions Management Plan (Exploration and Exploitation Phases)

8.5.1 Introduction

This procedure details the steps to follow to implement the appropriate measures to prevent, minimize or mitigate the negative impacts on human health and the environment caused by the air emissions pollutants generate from Project activities, as well as to reduce the Greenhouse Gas Emissions.

8.5.1.1 Objective

The general objective of this Plan is to define framework and actions to implement mitigation measures to control and minimize potential sources of air emissions. This Plan also aims to:

- Comply with applicable local and international air quality standards as listed in the IFC EHS General Guidelines (whichever is more stringent);
- Identify the potential sources of air impacts during Project construction and operation;
- Define construction and operation procedures for emissions management in order to eliminate, minimize and/or mitigate any air emissions ensuring they are controlled to acceptable levels;
- Align with international best practices;
- Define the procedures and mitigation measures to be applied to construction and operation activities that have the potential to produce air emissions;
- Define training and communication commitments; and
- Define the monitoring, reporting, and adaptive management procedures for the Plan.

8.5.1.2 Scope of Application

The procedures identified in this Plan will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

This Plan includes measures related to the management of air emissions resulting from Project activities. This plan shall be distributed to all contractors / subcontractors, and it shall be included in all contractual documentation and used as a basis for all specific Air Emissions Management Plans to be prepared by all engaged parties. Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.5.2 Roles and Responsibilities

In order to properly implement the Air Emissions Management Plan, NREI requires the involvement of the people listed below.

Table 8-8: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Noise Management Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Air Emissions Management Plan
Head of ESG	■ Assure the correct implementation of the Air Emissions Management Plan
ESG Manager	■ Assure the correct implementation of the Air Emissions Management Plan ■ Update the Air Emissions Management Plan ■ Respond to detections of contaminants of concern ■ Review and approve the contractor project-specific Air Emissions Management Plan
Environmental Coordinator or H&S Manager	■ Ensure the generation of evidence and reports to ensure compliance with the recommended exposure limits as well as maintaining NREI's KPIs. ■ Ensure the internal coordination to follow the Air Emissions Management Plan
Contractor Company	■ Develop a project-specific Air Emissions Management Plan ■ Develop and implement additional mitigation measures in the event of exceedences to the recommended limits or if a proposed mitigation measure does not result in sufficient air emissions control ■ Ensure that workers have access to personal protective equipment (PPE) and are trained in appropriate use and jobs with potential for exposure to elevated air emissions levels
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Air Emissions Management Plan

Typical roles and responsibilities are as follows:

- As project phases unfold, Contractors will be responsible for overseeing the implementation of the Air Emissions Management Plan. Contractors must develop and deliver a list of all air emissions management procedures, specific to each function. In the event of the detection of an exceedance or if a control measure does not result in sufficient air emissions control, Contractors will work with NREI to identify and implement additional control measures to address the issue.
- Prior to the start of construction activities, each Contractor must prepare its own management plans and inspection procedures. Said management plans will be reviewed and approved by the NREI before the works begin, in order to ensure consistency between this management plan.
- Workplace supervisors will ensure that air emissions management measures and BMPs are implemented prior to commencing Project activities and oversee health and safety factors for Contractors in relation to air emissions management and enforce established environmental incident prevention and safety practices.

8.5.3 Sources of Impacts

Project activities could result in the following negative impacts to social and environmental receptors located within the project's area of influence:

- Increase in the generation of gas and particle emissions from equipment, machinery and vehicles (mobile sources) that use hydrocarbons as a fuel source;

- Increase in the emission of vapors and gases from drilling and well testing activities on site;
- Dust emission from areas devoid of vegetation and gaseous emissions from construction equipment and machinery and vehicles that transport materials and/or waste; and
- Generation of vehicular emissions and suspension of particles during the operation phase, due to the circulation of mobile equipment involved in maintenance work.

8.5.4 National/International Standards

There are no national ambient air quality standards in Saint Kitts and Nevis; therefore, international limits for ambient air quality levels will be applied. Standards applicable to the Project include:

- The IFC's General Environmental, Health, and Safety (EHS) Guidelines for Air Emissions and Ambient Air Quality,
- The National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (REL);
- Occupational Safety and Health Administrations (OSHA) Permissible Exposure Limits (PEL); and
- Best practices.

The following table presents the guidelines for ambient air quality.

Table 8-9: Guidelines for Ambient Air Quality for Typical Air Pollutants

Compound	Averaging Period	Guideline Value in µg/m^3
Sulfur dioxide (SO_2)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO_2)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter (PM_{10})	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter ($PM_{2.5}$)	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Hydrogen sulfide, mercury, and carbon dioxide are the main potential air pollutants associated with geothermal power generation. Potential emissions of these contaminants may occur during well drilling and flow testing activities, and via the open contact condenser / cooling tower systems unless pumped out of the condenser. Vent mufflers can also be potential sources of hydrogen sulfide emissions, primarily during upset operating conditions when venting is required. Under normal operating conditions, binary technologies (with non-contact condensing technology) have close to zero emissions of hydrogen sulfide or mercury to the atmosphere because of reinjection of all geothermal fluids and gases.

The most recent sampling at the Project site showed the presence of carbon dioxide at concentrations typical of high-temperature geothermal systems, as well as hydrogen sulfide at low concentrations (from 137 to 178 parts per million by weight (ppm - wt). St. Kitts and Nevis does not have a national ambient air quality standard for public exposure to hydrogen sulfide.

In addition to the possible exposure to the above mentioned contaminants, the geothermal plant will also use and store n-pentane as the working fluid in the equipment. Although this is a closed system, a failure to this system could lead to n-pentane being released to the immediate surroundings.

The following table provides the NIOSH and OSHA recommended exposure limits to the possible air contaminants that could be released at the Site:

Table 8-10: Hydrogen Sulfide Exposure Limits

Compound	OSHA PEL	NIOSH REL
Hydrogen Sulfide (H_2S)	10 ppm (8-hour Time Weighted Average (TWA)), 50 ppm [10-minute maximum peak]	10 ppm (15 mg/m3) [10-minute]
n-pentane	1,000 ppm (2950 mg/m3) TWA	120 ppm (350 mg/m3) TWA, 610 ppm (1800 mg/m3) [15-minute]

8.5.5 Approach

The Project will comply with the standards identified in Section 4, as well as implementation of management practices and mitigation measures identified in the ESIA. It is expected that the majority of the air emissions will be temporary in nature and will be related to construction activities. Typical construction type emissions have to do with fugitive emissions which include dust (particulate matter (PM)) and odors, and other contaminants mainly associated with combustion processes (nitrous oxides (NOx), sulfur dioxide (SO2) and carbon monoxide (CO)). As previously mentioned, hydrogen sulfide and carbon dioxide emissions are possible during well drilling and testing during the construction phase and upset conditions during operations.

The general approach to air emissions management is described below:

- **Minimization:** Whenever possible, air emissions will be minimized at the source.
- **Monitoring:** Monitors will be installed during both the construction and operation phases of the project in order to implement mitigation measures as necessary when contaminants of concern are detected. In case of detection, implement mitigation and response measures.
- **Mitigation:** NREI will establish procedures for addressing the different emission streams. Procedures include dust control measures, vehicle and equipment specifications and chemical additives to reduce contaminants of concern.

8.5.6 Management/Mitigation Measures

8.5.6.1 Dust Control

The most common air pollutant expected during construction activities is the fugitive source emissions of dust, measured as particulate matter (PM). Dust is likely to be released during certain activities (i.e. transport or outdoor storage of solid materials, uncovered land surfaces, or transit on unpaved roads). NREI will implement the following dust suppression methods to minimize emissions:

- Watering unpaved roads/temporarily exposed bare soils;
- Reseeding bare soils as soon as possible to establish grass coverage and limit soil dispersion;
- Ensuring all trucks moving materials are covered;
- Minimize earth movement activities.

8.5.6.2 Combustion Gases and Mobile Sources

Combustion emissions from equipment, machinery and vehicles used for Project activities include CO, NOx, SO2, PM and VOCs. In order to minimize these emissions, The Project will ensure that all contractors during construction and NREI during operation adhere to the following:

- Regardless of the size or type of vehicle in question, fleet owners/operators must apply the mechanical maintenance programs recommended by the manufacturers;
- Drivers will receive training on the advantages of vehicle driving practices that reduce both the risk of accidents and fuel consumption, as well as the importance of avoiding sharp accelerations and respecting speed limits; and
- To the extent possible, the following methods will be considered for reducing potential impacts:
  - Replacement of old vehicles with modern alternatives, with greater energy control;
  - Adaptation of the most used vehicles to cleaner energies, whenever feasible;
  - Installation and maintenance of emission control devices, such as catalytic converters; and
  - Implementation of a periodic vehicle maintenance and repair plan.

8.5.6.3 Odors and Process Emissions

During construction activities, monitors for hydrogen sulfide and carbon dioxide will be available on the drilling equipment. In addition, monitors will be placed strategically around the site (see Monitoring Section below) to detect any contaminants of concern. Equipment utilized is designed to reduce the possibility of emissions at the source; however, during well flow tests, emissions will not be controlled. Any detections that may cause community complaints, shall be reported to the Environmental Coordinator for action.

During operation, monitors with audible alarms will be in place to detect emissions of contaminants of concern; however, emissions are not expected from the closed binary system.

8.5.6.4 Greenhouse Gas Emissions

Emission of greenhouse gases (GHG) such as CO_2, methane (CH_4), NOx, and chlorofluorocarbons (CFCs) will be temporary and will come mainly from vehicle and machinery used during construction. In order to reduce GHGs, the measures described in Section 6.1.2 above will be applied.

8.5.7 Air Emissions Monitoring and Response

Air emissions monitoring will occur during two phases of the Project, during construction operation as described below.

8.5.7.1 Construction

Dust and Particles

Site personnel will be trained in identifying potential activities that could lead to dust and particle emissions in order to implement the appropriate preventive measures. If personnel observe dust and particle emissions during construction activities, they will assess the situation and implement the appropriate mitigation measures as described above.

Odors and Process Emissions

During construction, equipment used for drilling will be equipped with gas sensors. Rig equipment and tubulars have been selected and fitted for sour service (conditions where hydrogen sulfide is present). In addition to the gas detection sensors in the Mud Cooler Equipment, the proposed drilling equipment includes hydrogen sulfide detection sensors and carbon dioxide detection sensors for worker safety (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019). If any amounts of hydrogen sulfide are encountered, the drilling crew will maintain the pH at or above 11 with lime. Signs of hydrogen sulfide gas include:

- Reduction of mud pH
- Discoloration of mud (to a dark color)
- Rotten egg odor
- Formation of black scale on steel drill pipe

Continuous monitoring and recording of hydrogen sulfide and carbon dioxide will be performed at the at the shale shaker, cellar, and driller's station, and any other location to be specified by the Operator (Schlumberger, Nevis Island - 4 Geothermal Wells Campaign, Drilling Scope Proposal, 2019).

If hydrogen sulfide gas is detected at levels that will produce unacceptable odors at downwind residences, NREI will inject abatement chemicals into the drilling rod to reduce hydrogen sulfide emissions to acceptable levels (see Section 4.4.8.2 below) (PIA, 2017).

NREI will develop an evacuation plan, and a wind sock will be mounted on site so that plant personnel can move up-wind from a leak.

8.5.7.2 Operation

Dust and Particles

Dust and particle emissions are not expected as a result of operation activities. However, if site activities take place that could disturb soils, the mitigation measures described above will be implemented. Any vehicle carrying materials on site that could potentially lead to dust and particle emissions will be covered as discussed above. Site personnel will be trained in identifying potential activities that could lead to dust and particle emissions in order to implement the appropriate preventive measures.

Odors and Process Emissions

Working fluid (n-pentane) detectors will be strategically placed around the binary plant facilities. An audible alarm will alert the operators if one of the sensors detects more than 120 parts per million (ppm) n-pentane, the permissible exposure limit adopted by NIOSH for the 10-hour work day. The plant personnel will be trained on n-pentane safety.

Hydrogen sulfide detectors will be placed around the well pads and testing facilities and the rock muffler. An audible alarm will alert the operators if one of the sensors detects more than 10 ppm of hydrogen sulfide in accordance with the OSHA 8-hour exposure limit.

NREI will develop an evacuation plan, and a wind sock will be mounted on site so that plant personnel can move up-wind from a leak.

8.5.8 Training

Before the start of the construction, all project personnel identified within Section 2 – Roles and Responsibilities must have received a copy of the Plan and understand their respective responsibilities.

All Project activities will consider the reduction and appropriate management of air emissions. To accomplish this, all Project personnel will be trained in the general awareness and procedures concerning emissions management. Personnel involved with the air emissions generation will receive additional training including refresher and updates to the training. Training will be provided in the implementation of this procedure.

8.5.9 Documentation and Record Keeping

Evidence of air emissions management will be maintained through monitoring logs.

8.5.10 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this Plan:

Table 8-11: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Health and Safety	Air emissions monitoring reports must be below recommended levels	100%	Construction and Operation	Monitoring logs / Weekly
Health and Safety	100% of the employees assigned to handled air emissions must have the appropriate training	100%	Construction and Operation	Training documents / Quarterly

8.6 Noise Management Plan (Exploration and Exploitation Phases)

8.6.1 Introduction

Nevis Renewable Energy International, Inc. (NREI) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plan (ESMP) policies and procedures.

This Noise Management Plan (Plan) is designed to control and minimize potential sources of noise during construction and operation of the Project. This Plan describes potential sources of noise during Project construction and operation, noise standards applicable to the Project, and proposed measures and best management procedures (BMP) to be implemented to protect environmental and social receptors from potential adverse impacts associated with the increase of airborne noise.

8.6.1.1 Objective

The objective of this Plan is to define framework and actions to implement the mitigation to control and minimize potential sources of noise. The following objectives are also part of this Management Plan:

- Comply with applicable local and international noise requirements;
- Identify the potential sources of noise impacts during Project construction and operation;
- Define construction and operation procedures for noise management;
- Align with international best practices;
- Define the procedures and mitigation measures to be applied to construction and operation activities that have the potential to produce noise;
- Define training and communication commitments; and
- Define the monitoring, reporting, and adaptive management procedures for the Plan.

8.6.1.2 Scope of Application

The procedures identified in this Plan will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

The Noise Management Plan includes measures related to the management of airborne noise resulting from Project activities. This plan shall be distributed to all contractors / subcontractors, and it shall be included in all contractual documentation and used as a basis for all specific Noise Management Plans to be prepared by all engaged parties. Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.6.2 Roles and Responsibilities

In order to properly implement the Noise Management Plan, NREI requires the involvement of the people listed below.

Table 8-12: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Noise Management Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Noise Management Plan
Head of ESG	■ Assure the correct implementation of the Noise Management Plan
ESG Manager	■ Assure the correct implementation of the Noise Management Plan

	■ Update the Noise Management Plan ■ Respond to noise complaints ■ Review and approve the contractor project-specific noise management plan.
Environmental Coordinator or H&S Manager	■ Ensure the generation of evidence and reports for national compliance and compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Noise Management Plan
Contractor Company	■ Develop a project-specific noise management plan ■ Develop and implement additional noise mitigation measures in the event of noise complaints or if a proposed mitigation measure does not result in sufficient noise control ■ Ensure that workers have access to personal protective equipment (PPE) and are trained in appropriate use and jobs with potential for exposure to elevated noise levels
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Noise Management Plan ■ Use PPE as needed to protect against exposure to elevated noise levels during Project construction and operation

Source: NREI, 2020

Typical roles and responsibilities are as follows:

- As project phases unfold, Contractors will be responsible for overseeing the implementation of the Noise Management Plan. Contractors must develop and deliver a list of all noise management procedures, specific to each function. In the event of a noise complaint or in the event that a noise control measure does not result in sufficient noise control, Contractors will work with NREI to identify and implement additional noise control measures to address the noise complaint or ensure sufficient noise control.
- Prior to the start of work involving the generation of airborne noise, each Contractor must prepare its own management plans and inspection procedures. Said management plans will be reviewed and approved by the NREI before the works begin, in order to ensure consistency between the noise management plans.
- Workplace supervisors will ensure that noise management measures and BMPs are implemented prior to commencing Project activities, oversee health and safety factors for Contractors in relation to noise management, and enforce established environmental incident prevention and safety practices.

8.6.3 Sources of Impacts

Noise will be generated during Project construction and operation. Construction is anticipated to last 17 to 18 months and will involve the use of heavy equipment to clear and grade project parcels, construct the well pads and plant foundations, drill the two production wells and two injection wells, perform well testing, install the aboveground production and injection pipelines, assemble and install power plant equipment and related facilities (e.g., control room), and trench and install the underground transmission intertie line. In general, Project construction will proceed in phases in which one activity is finished before the next activity begins (e.g., clearing and grading will be completed before well pads are constructed); however, some phases could overlap slightly. The majority of the construction activities will occur during daylight hours; however, well drilling and testing will occur 24hours a day in three locations for an estimated 40 days per location.

During operation, the primary sources of airborne noise will include the power plant equipment, pipelines, and venting during startup and shutdowns. The air-cooled condensers, which will use large fans to force air over thin fans containing the binary system working fluid, will produce the highest equipment levels.

During daytime hours when demand for electricity is higher, Nevis assumes that all 24 air-cooled condensers will be operating. During nighttime hours when demand for electricity is lower, Nevis predicts that 12 air-cooled condensers will be operating.

8.6.4 National and International Standards

There are no national noise standards in Saint Kitts and Nevis; therefore, international limits for ambient/airborne noise levels will be applied. Legal and numeric standards applicable to the Project include:

- Environmental, Health, and Safety (EHS) Guidelines: Construction and Decommissioning, International Finance Corporation (IFC);
- EHS Guidelines: Geothermal Power Generation, IFC;
- IFC limits for ambient/airborne noise levels; and
- Best practices for occupational noise.

The following table presents the IFC guidelines for ambient noise.

Table 8-13: IFC Guidelines for Ambient Noise

Receptor	Maximum Ambient Noise Level, L_{eq}, 1 hour (dBA)	
	Daytime (07:00-22:00)	Nighttime (22:00-07:00)
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70
Source: IFC 2007. Leq, 1 hour = statistical noise descriptor that represents the equivalent continuous sound pressure level over a 1-hour period; dBA = A-weighted decibel.		

In addition to the guidelines for sound contribution from a source at a receptor, the IFC also indicates that noise associated with a project should not cause the ambient noise level to rise by more than 3 dBA at the nearest off-site receptor.

The United States National Institute for Occupational Safety and Health (NIOSH) recommends that noise be controlled to at or below 85 dBA for an 8-hour exposure (equivalent to a standard workday). For construction or operational tasks where workers may be exposed to noise levels above 85 dBA, PPE is recommended to mitigate the noise exposure.

8.6.5 Approach

The Project will comply with IFC standards identified in Section 4, as well as implementation of management practices and mitigation measures identified in the ESIA. The general approach to noise management is described below:

- **Minimization:** Whenever possible, noise will be minimized at the source by maintaining construction and operational equipment in good working order, and maintaining built-in noise minimization equipment such as mufflers, where applicable. During the construction phase of the Project, the majority of activities will be completed during daytime hours. Only well drilling and testing will occur 24 hours a day, 7 days per week. During the Project operational phase, only 12 or the 24 total air-cooled condensers will be operated during nighttime hours when demand for electricity is lower.
- **Noise Mitigation (Shielding):** During well drilling and testing, NREI will construct an earthen berm associated with the installation of the drilling mud containment pond. This berm will be installed prior to well drilling activities and will provide sound shielding at the nearby receptors during well. In addition, NREI will use a silencer or rock muffler during all well venting activities.

During Project operation, NREI will maintaining vegetative buffers and/or planting trees and other dense vegetation between the facility and noise receptors to increase soft ground cover and potential attenuation of noise levels.

- **Landowner Notification:** Provide receptors within 1,000 feet of the project parcels written notice prior to the start of construction that describes the approximate schedule for the construction activities and a contact name and phone number for the construction contractor and NREI staff person responsible for handling construction-related noise complaints.
- **Noise Monitoring:** NREI will establish baseline sound levels at the nearby receptors prior to commencing construction, and will monitor noise levels at the nearby receptors during construction and operation.
- **Noise Complaint Resolution:** NREI will establish a procedure for receiving noise complaints during Project construction and operation, along with a procedure for complaint resolution. This procedure will identify parties' responsibility for investigating the complaint, establishing a response plan, and ensuring that the response plan resolves the noise complaint.
- **Personal Protective Equipment:** NREI or its contractors will provide PPE for construction and operational staff and training on how to properly use PPE. PPE will be used during tasks where workers may be exposed to noise levels above 85 dBA to mitigate the noise exposure.

8.6.6 Management and Mitigation Measures

8.6.6.1 Construction Noise

To minimize impacts at residential receptors from construction noise, NREI will require contractors to implement the following noise mitigation measures:

- Install an earthen berm between drilling locations and residential receptor locations within 1,000 feet of the drill rig.
- Provide receptors within 1,000 feet of the project parcels written notice prior to the start of construction that describes the approximate schedule for the construction activities and a contact name and phone number for the construction contractor and NREI staff person responsible for handling construction-related noise complaints.
- Provide receptors within 1,000 feet of drilling sites at least one week's advance written notice of the start of well drilling, well venting, and well testing activities.
- Use a silencer or rock muffler during all well venting activities, including initial cleanout, as feasible.
- Implement the noise management plan that details noise monitoring requirements and noise complaint resolution recommendations.
- Provide PPE for workers completing tasks where noise levels exceed 85 dBA to mitigate the noise exposure.

8.6.6.2 Operational Noise

To minimize facility sound levels and ensure that noise contributions at nearby receptors and increases in ambient noise comply with IFC guidelines, NREI will implement the following mitigation measures:

- Reducing the amount of air-cooled condensers operating during the nighttime period (10 PM to 7 AM) to the minimum amount necessary to safely and efficiently provide necessary electrical load requirements.

- Maintaining vegetative buffers and/or planting trees and other dense vegetation between the facility and noise receptors to increase soft ground cover and potential attenuation of noise levels.
- Implement the noise management plan that details noise monitoring requirements and noise complaint resolution recommendations.
- Provide PPE for workers completing tasks where noise levels exceed 85 dBA to mitigate the noise exposure.

8.6.7 Noise Monitoring

Noise monitoring will occur during three phases of the Project: pre-construction, during construction, and during Project operation. Each of these three phases will include noise monitoring at each of the noise receptors identified on Figure 7-1.

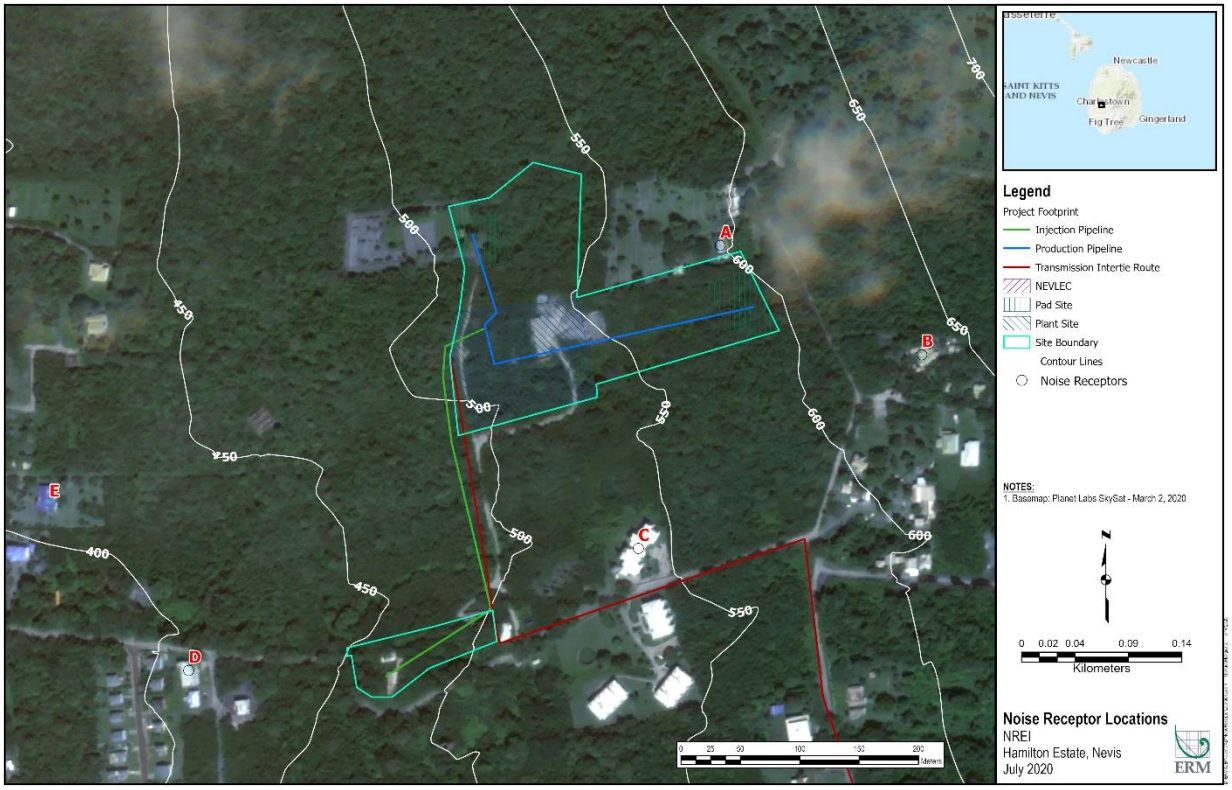


Figure 7-1: Nearest Residential Noise Receptors

Pre-construction noise monitoring: Prior to construction, NREI will document daytime and nighttime noise levels as equivalent (L_{Aeq}) A-weighted decibels (dBA) per the guidelines for completing noise monitoring referenced in the IFC EHS guidelines for noise management (Chapter 1.7). The daytime and nighttime L_{Aeq} sound levels will be established at each of the five residential receptors identified in Figure 7-1.

Construction noise monitoring: Within one month of commencing general Project construction, NREI will complete a one-time noise-monitoring event to document daytime noise levels as L_{Aeq} (dBA) per the guidelines for completing noise monitoring referenced in the IFC EHS guidelines for noise management (Chapter 1.7). The daytime L_{Aeq} sound levels will be established at each of the five residential receptors identified in Figure 7-1.

Within one week of commencing well installation, NREI will complete an additional noise-monitoring event to establish daytime and nighttime L_{Aeq} sound levels at each of the five residential receptors identified in Figure 7-1. If any of the noise levels exceed the nighttime noise levels in Table 4-1, then NREI will identify additional noise controls to be installed to meet IFC noise guidelines and a timeline for implementing these measures.

Operational noise monitoring: Within three months of placing the full facility into operation, NREI will complete a one-time noise-monitoring event to document daytime and nighttime noise levels as L_{Aeq} (dBA) per the guidelines for completing noise monitoring referenced in the IFC EHS guidelines for noise management (Chapter 1.7). The daytime and nighttime L_{Aeq} sound levels will be established at each of the five residential receptors identified in Figure 7-1.

If any of the noise levels exceed the standards identified in Section 4, either based on the daytime or nighttime noise levels in Table 4-1, or the background sound level increase is greater than 3 decibels at the nearest residential receptor based on the background sound level established during the pre-construction noise survey, then NREI will identify additional noise controls to be installed to meet IFC noise guidelines and a timeline for implementing these measures.

8.6.8 Training and Complaint Resolution

Before the start of the construction, all project personnel identified within Section 2 – Roles and Responsibilities must have received a copy of the Plan and understand their respective responsibilities.

Prior to the start of construction, NREI will establish a procedure for receiving noise complaints during Project construction and operation, along with a procedure for complaint resolution. This procedure will identify parties' responsibility for investigating the complaint, establishing a response plan, and ensuring that the response plan resolves the noise complaint.

All Project construction and operational staff will be trained regarding proper use of PPE, and will be informed of tasks where noise levels exceed 85 dBA to ensure that PPE is used during completion of these tasks.

8.6.9 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this Plan:

Table 8-14: Key Performance Indicators

Receptor	Impact	Mitigation Measures	Responsibility	Timing	Monitoring and KPI Frequency
Human Use and Residences	Potential increase in daytime airborne noise during general Project construction	Provide receptors within 1,000 feet of the project parcels written notice prior to the start of construction that describes the approximate schedule for the construction activities and a contact name and phone number for the construction contractor and NREI staff person responsible for handling	Head of ESG/ESG Manager/Environmental Coordinator of H&S Manager/ ESG Manager Construction Contractor	Construction (17 to 18 months)	Implement noise monitoring described in Section 7 and complaint resolution procedures; Daily site inspection for appropriate PPE use.

Receptor	Impact	Mitigation Measures	Responsibility	Timing	Monitoring and KPI Frequency
		construction-related noise complaints. Project construction staff will receive appropriate required PPE and training in their use. Hearing protection will be required for any tasks with the potential for exposure to noise levels above 85 dBA or as outlined in the EPC contractor's worker health and safety plan.			
Human Use and Residences	Potential increase in daytime and nighttime airborne noise during well drilling/testing	Install an earthen berm between drilling locations and residential receptor locations within 1,000 feet of the drill rig; Provide receptors within 1,000 feet of drilling sites at least one week's advance written notice of the start of well drilling, well venting, and well testing activities; Use a silencer or rock muffler during all well venting activities, including initial cleanout, as feasible. Project construction staff will receive appropriate required PPE and training in their use. Hearing protection will be required for any tasks with the potential for exposure to noise levels above 85 dBA or as outlined in the EPC contractor's worker health and safety plan.	Head of ESG/ESG Manager/Environmental Coordinator of H&S Manager/ ESG Manager Drilling Contractor	Construction (40 days per well location)	Implement noise-monitoring requirements described in Section 7. If nighttime noise attributable to well drilling exceed 45 decibels (L_{Aeq}), then additional noise mitigation measures are needed; Implement complaint resolution procedures; Daily site inspection for appropriate PPE use.
Human Use and Residences	Potential increase in daytime and nighttime airborne noise during Project operation.	Reducing the amount of air-cooled condensers operating during the nighttime period (10 PM to 7 AM) to the minimum amount necessary to safely and efficiently provide necessary	Head of ESG/ESG Manager/Environmental Coordinator of H&S Manager/ ESG Manager	Operation	Implement noise-monitoring requirements described in Section 7. If daytime noise attributable to facility

Receptor	Impact	Mitigation Measures	Responsibility	Timing	Monitoring and KPI Frequency
		electrical load requirements; Maintaining vegetative buffers and/or planting trees and other dense vegetation between the facility and noise receptors to increase soft ground cover and potential attenuation of noise levels; Noise complaint resolution recommendations; Project operational staff will receive appropriate required PPE and training in their use. Hearing protection will be required for any tasks with the potential for exposure to noise levels above 85 dBA or as outlined in the EPC contractor's worker health and safety plan.			operation exceeds 55 decibels (L_{Aeq}) or nighttime noise attributable to facility operations exceeds 45 decibels (L_{Aeq}), then additional noise mitigation measures are needed; Implement complaint resolution procedures; Routine site audits to ensure that Project staff have access to PPE and are using it as directed.

8.7 Natural Disasters Management Plan (Exploration and Exploitation Phases)

8.7.1 Introduction

This Natural Disasters Risk Management Plan is aligned with national regulations and take into account the characteristics of the type of operation and specific project location. Due to its geographic location, the Project is highly exposed to meteorological and geophysical threats such as earthquakes, landslides, hurricanes, and volcanic eruptions. This plan presents guidelines and procedures to follow in the event of a natural disaster. Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of this Plan and of all of the Environmental and Social Management Plan (ESMP) policies and procedures.

Nevis is located within the Eastern Caribbean track, an area that has seen at least 28 storms in the last decade (StormCarib, 2020). A high category hurricane could potentially damage project facilities. Because of the high risk of hurricanes in the area, a separate Hurricane Hazard Awareness and Preparation Plan has already been prepared for the Project.

The Eastern Caribbean is a seismically active area. Most of the earthquakes occurring in the Eastern Caribbean are either tectonic or volcanic in origin. Tectonic earthquakes are generated when plates move as accumulated energy is released. Volcanic earthquakes are generated by the movement of magma within the lithosphere (UWI, 2011). A large seismic event could cause landslides and tsunamis, resulting in damage to project facilities causing impacts to the environment. Nevis Peak, located in the center of the island is also a potentially active volcano. Although the youngest dated eruption was about 100,000 years ago, active fumaroles and hot springs are found on the island (the most recent of these formed in 1953 and remains active), and seismic swarms have occurred on several occasions during the 20th century (Smithsonian Institution, 2013).

Disaster response planning involves determining, increasing, and organizing resources and capacities to achieve a degree of preparedness that enables a timely and effective response to a potential disaster. When a disaster strikes, plans must be monitored, evaluated and adapted to a given situation.

8.7.1.1 Objectives

The main objectives of this Plan are:

- Minimize or control damage from natural disasters to the project facilities;
- Establish procedures and response actions to respond to a natural disaster in a timely and efficient manner with the necessary resources;
- Prevent damage to human lives and the property of the company and third parties; and
- Maintain permanent control of equipment and facilities, through the performance of periodic inspections.

8.7.2 Roles and Responsibilities

In order to properly implement this Plan, NREI requires the involvement of the people listed below.

Table 8-15: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Natural Disasters Management Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Natural Disasters Management Plan.
Head of ESG	■ Ensure the correct implementation of the Natural Disasters Management Plan.
ESG Manager	■ Assure the correct implementation of the Natural Disasters Management Plan ■ Update the Natural Disasters Management Plan. ■ Review and approve the contractor project-specific Natural Disasters Management Plans.
Environmental Coordinator or H&S Manager	■ Ensure the generation of evidence and reports for compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Natural Disasters Management Plan.
Contractor Company	■ Develop a project-specific Natural Disasters Management Plan.
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Natural Disasters Management Plan
Community Relations Officer	■ Inform stakeholders of the Natural Disasters Management Plan

Source: NREI, 2020

8.7.3 General

In general, all project personnel are liable for the application of this plan and working in compliance to the plan. NREI will select Emergency Response team members who are familiar with the occupational health safety and emergency issues to oversee the implementation of this Plan.

8.7.3.1 Construction Phase

During Construction, the responsibility for risk management is the responsibility of the Contractor who will select a Construction Site Manager/Emergency Manager (or shared by the different contractors and subcontractors involved with the Project at the moment). However, NREI is responsible for guaranteeing that the actions of responsibility in the management of risks and contingencies are carried out. Therefore, it is required that contractors and/or subcontractors follow the procedures of this plan. NREI is also responsible for communication and coordination with local authorities in response to a natural disaster.

The Construction Site Manager:

- Makes decision on:
  - Whether to call the local emergency organization (fire, ambulance, police, etc.);
  - if the site should be evacuated or if personnel can continue working;
- Organizes requisite trainings for personnel;
- Leads the Emergency Brigade/Response Team until the local emergency organization arrives;
- Makes arrangements safe evacuations and ensures all personnel gather at the assembly points (contacts the appropriate authorities if anyone is missing).
- Gathers information on the number of injuries and the scale of the damage and harm on equipment and assets;
- Ensures that the required information is conveyed to the Project owners and any subcontractors.

The Contractor shall ensure compliance with the standards of their construction works, and for each job and/or discipline, as mandatory to comply with the contract clause. Such obligations include:

- Provide workers with the resources and the personal protective equipment suitable for emergency response and for the activities to be carried out;
- Create an emergency brigade, which will receive specialized training in preparation and response to the different types of natural disasters to which they may be exposed depending on the location of the Project;
- Training for Project personnel regarding plans and procedures in an emergency situation caused by a natural disaster; and
- Coordination of drills.

8.7.3.2 Operation Phase

During the operation stage, NREI is responsible for leading natural disaster risk management. New plans and specific procedures must be prepared, which are in accordance with the processes and vulnerabilities specific to each operation. NREI's Site Manager has the same responsibilities as those described above during construction activities.

The operation must also have a properly trained Emergency Brigade, the personnel must receive periodic training, and drills will be carried out for each type of natural disaster to which the particular project is exposed.

The Emergency Brigade/Response Team shall:

- Be trained in the appropriate use of fire extinguishing equipment and intervene as per the instruction Site Manager if the fire is not severe;
- Maintains up-to-date information for local emergency organizations (fire brigade, ambulance, police) during non-emergency times;
- Helps the Site Manager:
  - Keep the area safe until the local emergency organizations arrive;
  - Coordinate personnel at the assembly point, and if required, safe evacuation;
- Provides first aid to injured persons to the extent possible until medical personnel or ambulance arrives.

Security Personnel shall:

- Control the Site gates and only allows the entrance of the local emergency vehicles;
- Control traffic in and out of the site during emergencies.

8.7.4 Drills and Training

All personnel on site will receive training prior to starting work at the site and refresher training will be conducted at least yearly after that. After organizing the site's Emergency Brigade, they will be trained on the content of this Plan and their responsibilities and duties in case of each type of emergency will be explained. Emergency brigade titles will be given to the emergency response team for them to place on their helmets.

In addition to the training, emergency response drills will also be conducted at least yearly. The drills will be conducted without notice and the response times will be monitored and recorded.

The Emergency Response Plans will be reviewed and revised if improvements are needed after the drills. After the drill, trainings will be organized to resolve any faults encountered during the drills.

8.7.5 Procedures during a Natural Disaster Emergency

8.7.5.1 Informing the Emergency

The Site Manager must inform all site personnel and the Project Owners of any anticipated emergency in order to prepare the site or evacuate accordingly.

8.7.5.2 General Actions in the Event of an Earthquake

Preparation before an Earthquake

- Earthquake related risks will be considered during the construction and installation of critical systems (electricity, pressure pipes and tanks, fire and cooling water systems, hydraulic lines, etc.) and the communication network that can cause emergencies indirectly.
- Train operational personnel to how to react in earthquake emergencies through evacuation drills, so that personnel are prepared for these events;
- Ensure equipment on-Site that can topple over during earthquakes is secured to the walls or floors (for example, lighting, air conditioners, ceiling fans and other equipment that is suspended will be done in a way that can sustain their weight). Heavy objects will not be placed at heights if it can be avoided;
- Organize an orderly and safe evacuation route to be prepared for a high magnitude earthquake; and
- Provide vertical and horizontal signaling of evacuation routes in case of earthquakes, as well as extinguishers to control fire outbreaks which could result.

During an Earthquake

- Personnel should stop work that is being executed in order to avoid accidents;
- All personnel shall immediately leave the work area the moment the earthquake is perceived;
- If inside the facilities, look for strong structures: under the lintel of a door, next to a pillar or a sturdy wall;
- If off-site, stay away from what could collapse or hurt you;
- Put out any signs of a fire;
- If possible, find an open area where there is no possibility of falling structures;
- If the earthquake occurs at night, flashlights will be used; never matches, candles or lighters; and
- Stay away from electric wires and glass.

After an Earthquake

- Technical staff must report to the main office/go to areas where urgent technical support is required;
- Immediately disconnect the power supply and water;
- Look for traces of short circuits before reconnecting;
- DO NOT light matches (or smoke) before making sure there are no leaks or spills of flammable material;

- Avoid approaching broken electrical cables;
- Act in accordance with the established procedures in case of fire and/or spill, depending on the situation;
- Resume operations as soon as it is certain that the operational conditions are safe;
- Proceed to clean any debris that obstruct operation;
- Clean and remediate any chemical spill.
- Inspect and repair all scaffolding.
- Repair fencing and barricades to secure the site and prevent unauthorized access
- Repair or replace damaged water, electric or gas lines.
- After the earthquake is over, damage to equipment and facilities must be evaluated, as well as preparing the reports required by government authorities, as recommended and within the established deadlines;
- For higher magnitude earthquakes, well integrity will be assessed to ensure casing and cementing remains intact. Well heads and all of its components shall be inspected to ensure no damage was caused by the earthquake;
- In the event of an earthquake that exceeds the design capacities of the project facilities and significant structural damage occurs, the operator must suspend operations, and follow the procedure defined for those cases; and
- Carry out an inspection and evaluation of the components of the facilities that have been affected. Inventory damaged construction, materials and equipment, and plan for replacement. Document with pictures for insurance purposes. Maintenance personnel will be required to report to the Site Manager any damage and the level of risk involved in entering damaged facilities.
- Once engineering and maintenance has given approval that entrance to a facility is secure, work activities may resume.
- Turn on water, power, and gas at source only once it is safe to do so.

8.7.5.3 General Actions in the Event of a Volcanic Activity and Landslides

In the event that volcanic activity or a landslide is anticipated, the Site Manager will decide on the appropriate course of action in collaboration with local authorities. In general, the following steps will be taken, depending on the risk to the Project site:

Prior to the Emergency

- Administer training exercises and drills to ensure workers are aware of and prepared in the event of each type of emergency and maintain records onsite documenting the training exercises and drills conducted;
- Prepare an action plan for each level of alert commensurate with the risk conditions for each level. This will include an evacuation plan and rescue procedures, which must take into account steps to safely abandon the operation (for example, de-energization, locking and or stopping of systems, and protection of equipment) and conditions under which the Project can return to normal operations and the procedures to document those conditions.

- Take measures to physically secure (for example anchoring to a wall) essential equipment or equipment that can cause fires or spills if affected by earthquakes resulting from volcanic eruptions.
- Be prepared either to shelter in place or to evacuate. Review the evacuation plans and make sure that everyone understands them. If it has not already been done, put together an emergency supply kit. Supplies will include the following:
  - Flashlight and extra batteries
  - First aid kit and manual
  - Emergency food and water
  - Sturdy shoes
  - Respiratory (breathing) protection
  - Eye protection (goggles)
  - Battery-powered radio

Note: Exposure to ash can harm your health, particularly the respiratory (breathing) tract. To protect yourself while you are outdoors or while you are cleaning up ash that has gotten indoors, use an N-95 disposable respirator (also known as an “air purifying respirator”). If you don’t have an N-95 respirator, you can protect yourself by using a nuisance dust mask as a last resort, but you will stay outdoors for only short periods while dust is falling (CDC, 2018).

During the Emergency

- Take appropriate measures to monitor the threat: through periodic monitoring of information published by the entity responsible for monitoring volcanic activity on the island, including information on the establishment of a state of alert;
- Sound any alarms, including both visual and auditory alerts, to notify personnel and the public of emergency conditions;
- In case evacuation is required, follow authorities’ instructions if they tell you to leave the area. Though it may seem safe to stay and wait out an eruption, doing so could be very dangerous. Volcanoes spew hot, dangerous gases, ash, lava, and rock that are powerfully destructive (CDC, 2018).
  - Preparing to evacuate
    - Tune in the radio or television for volcano updates;
    - Listen for disaster sirens and warning signals;
    - Review your emergency plan and gather your emergency supplies;
    - Prepare an emergency kit for your vehicle with food, flares, booster cables, maps, tools, a first aid kit, a fire extinguisher, sleeping bags, a flashlight, batteries, etc.;
    - Fill your vehicle’s gas tank;
    - If no vehicle is available, make arrangements for transportation, or follow authorities’ instructions on where to obtain transportation;
    - Place vehicles under cover, if at all possible;
    - Fill your clean water containers;
    - Fill sinks and bathtubs with water as an extra supply for washing.

- As you evacuate
  - Take only essential items with you;
  - If you have time, turn off the gas, electricity, and water.
  - Disconnect appliances to reduce the likelihood of electrical shock when power is restored;
  - Make sure your automobile's emergency kit is ready.
  - Follow designated evacuation routes—others may be blocked—and expect heavy traffic and delays.

- Follow the Communication Procedures in the Emergency Response Plan for notifying all appropriate personnel;
- If you are told to take shelter where you are

  - Keep listening to your radio or television until you are told all is safe or you are told to evacuate. Local authorities may evacuate specific areas at greatest risk in your community.
  - Close and lock all windows and outside doors.
  - Organize your emergency supplies and make sure all personnel know where the supplies are.
  - Make sure the radio is working.
  - Go to an interior room without windows that is above ground level.
  - It is ideal to have a hard-wired (non-portable) telephone in the room you select. Call the emergency contact— someone who is not near the volcano—and have the phone available if you need to report a life-threatening condition. Remember that telephone equipment may be overwhelmed or damaged during an emergency.

After the Emergency

Procedures for after an emergency are the same as those for earthquakes provided above.

8.7.6 Evaluating and Reporting

Evaluating an emergency response provides an opportunity to determine whether the concept of management systems, procedures, and plan processes effectively address the problems and needs of the operation.

At the end of the emergency, damage to personnel or facilities must be evaluated and a report must be prepared to the corresponding authorities. Likewise, the Emergency Brigade shall analyze the performance of the evacuation of personnel and coordinators.

The Emergency Brigade shall use previously established indicators and criteria to evaluate the different aspects of the plan in order to draw conclusions and lessons learned, and determine the necessary actions for improvement so that future emergency responses address problem areas.

8.7.7 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-16: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool/Frequency
Health and Safety	Employees must be in compliance with the training program (yearly)	100%	Construction and Operation	Training Records / Yearly
Health and Safety	Employees must be in compliance with the drills program and been instructed on incorrect actions and/or deficiencies (yearly).	100%	Construction and Operation	Training Records / Yearly
Health and Safety	Percentage of workers who have training on safety and emergency response.	100%	Construction and Operation	Training Records / Yearly

8.8 Well Blowout Prevention Plan (Exploration and Exploitation Phases)

8.8.1 Introduction

Nevis Renewable Energy International, Inc. (NREI) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plan (ESMP) policies and procedures.

To promote the Project's alignment to best international practices, NREI acknowledges that well control measures are an essential part to maintaining environmental and social health and safety of any geothermal project. Any uncontrolled flow of steam, brine or other well fluids constitutes a well blowout. Well control is the process of maintaining pressure inside the drilled wellbore in a manner that prevents gas or fluids from underground reservoirs flowing into the wellbore and escaping to the environment in an uncontrolled manner. This Well Blowout Prevention Plan details the steps to follow for the appropriate management of the wells in order to prevent potential impacts from a well blowout in the Projects AOI.

8.8.1.1 Objective

The objective of this plan is to comply with international best practice when it comes to well stability and control by identify project risks and providing appropriate mitigation. In general, the objectives of this plan include:

- Protect the health and safety of drilling, construction, and operating personnel
- Protect surface and groundwater quality for local users and the environment
- Define measures and procedures for blowout prevention functions including roles and responsibilities and training requirements;
- Comply with applicable regulatory requirements and recommended international guidelines and align with international best practices; and
- Define and implement monitoring and reporting procedures

8.8.1.2 Scope of Application

This procedure will apply during the development of NREI's activities and during the Project's life cycle (construction, operations and decommissioning). It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

8.8.2 Roles and Responsibilities

In order to properly implement the Well Blowout Prevention Plan, NREI requires the involvement of the people listed below.

Table 8-17: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Well Blowout Prevention Plan.

Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Well Blowout Prevention Plan.
Head of ESG	■ Ensure the correct implementation of the Well Blowout Prevention Plan.
ESG Manager	■ Assure the correct implementation of the Well Blowout Prevention Plan ■ Update the Well Blowout Prevention Plan. ■ Review and approve the contractor project-specific well blowout prevention plans.
Environmental Coordinator or H&S Manager	■ Ensure the generation of evidence and reports for compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Well Blowout Prevention Plan.
Contractor Company	■ Develop a project-specific Well Blowout Prevention Plan.
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Well Blowout Prevention Plan.

Source: NREI, 2020

Typical roles and responsibilities are as follows:

8.8.2.1 Construction

The Drilling Contractor is responsible for the implementation of the company policies and procedures on well control and will:

- Ensure that all personnel are fully aware of Company policies and procedures, and their own roles and responsibilities.
- Ensure tests and drills are carried out as required and their results are recorded and reported NREI

It is the responsibility of the Drilling Supervisor to:

- Acquaint himself with the drill site, the drill rig and drill pad;
- Be knowledgeable of H_2S procedures and verify that all personnel on site are suitably equipped and trained.
- Be acquainted with all project contingency plans;
- Keep NREI fully informed on any well control situations, and continuously discuss upcoming operations with regards to well control and concurrent operations philosophies.
- Ensure that all well operations are conducted with full primary well control, and that necessary kill mud and mud weight building material are present at all times.
- Ensure that early signs of over pressure are detected and recognized.
- Maintain a system of well control data sheets to be ready for immediate use if required.
- Review in detail the drilling and test programs and advise NREI of any aspects that might cause well control problems.
- Report the results of tests and drills carried out for well control purposes.

The Rig Drilling Engineer will:

- In conjunction with the engineer in charge of drilling muds, monitor mud logging for indications of abnormal pressure zones or lost circulation zones.

- Calculate the mud weights required to control the well, and supervise operations regarding kill mud preparation.
- Monitor and record details of events.
- Supervise formation strength tests.

Engineer in charge of Data Logger:

The Engineer in charge of the Data Logger has the prime responsibility to ensure the following monitoring systems are both fully operational and well maintained:

- Gas detection (including hydrogen sulfide - H_2S and carbon dioxide – CO_2).
- Drilling fluid data: Density, temperature, flow rates (both in and out of the well), resistivity, and surface volumes.
- Drilling parameters: Hook load, weight-on-bit, rotary torque, pump-rate, standpipe (& casing) pressure, and penetration rates.
- Monitor the resistivity and gamma ray readings that is continuously gathered downhole.

In addition, notify the Driller and Drilling Supervisor of any indications from the data being gathered of potential over pressures.

Engineer in charge of Drilling Muds:

The engineering in charge of the drilling muds is responsible for monitoring mud parameters. They will:

- Inform the Rig Driller and the Drilling Supervisor of changes in mud parameters that may indicate potential over pressures.
- Keep the Driller informed of any mud transfers, treatment, or any other act that will change the mud parameters or volume of the active mud system.
- Plan the maintenance of adequate chemical stocks required for well control purposes

8.8.2.2 Operation

The capacity, integrity, and security of the geothermal wellhead equipment are the responsibility of NREIs Plant Manager.

8.8.3 Blowout Preventers

The main function of the blowout prevention equipment is to safely control the flow of fluids at the surface of a well in case of a blowout. The requirements of the blowout prevention stack are to:

- Close the top of the wellbore to prevent the release of fluids or to allow for the safe diversion of these fluids away from the rig and personnel,
- Allow safe, controlled release of shut in, pressured fluids through choke lines and manifolds,
- Allow pumping of fluids (mud or water) into the wellbore through kill lines,
- Allow vertical movement of the drill pipe without realizing fluids.

8.8.4 Prevention Activities

8.8.4.1 Construction

Cementing of Casing

All casing strings will be cemented with a quantity of cement sufficient to fill the annular space back to the surface. The cement utilized will be a Class G Cement down to 200 feet, beyond which will be a Class G Cement with 50% Silica Lightweight additive to the final depth of the well. Cementing the casing is required in order to provide strength to the casing and prevent the movement of fluids into possible fresh water zones.

Equipment Testing

Equipment that may be exposed to well pressure will be pressure tested to a low pressure and then to a high pressure. Pressure testing will be conducted on:

- All blowout preventers and related equipment (when installed, prior to drilling out casing shoes, and following repairs or reassembly of the preventers that require disconnecting a pressure seal in the assembly)
- Casing,
- Choke and kill line valves, choke manifold valves, upper and lower kelly cocks, drill pipe safety valves, and inside blowout prevention equipment

All operational components of the blowout prevention equipment will also be function tested at least once a week to verify the components' intended operations. All flange bolts will be inspected at least weekly and retightened as necessary during drilling operations. The auxiliary control systems will be maintained in working order and inspected daily to check the mechanical condition and effectiveness.

In the event of casing failure during testing, the casing must be repaired or recemented until a satisfactory test is obtained. Results of the pressure tests will be documented and submitted to NREI for safekeeping.

Blowout Prevention Equipment and Procedures

Blowout preventers and related well control equipment will be installed, tested immediately after installation using water, and maintained ready for use until drilling operations are completed. The necessary components, such as packing elements and ram rubbers, will be of high-temperature resistant material. All kill lines, blowdown lines, manifolds, and fittings will be steel and have a temperature derated minimum working pressure rating equivalent to the maximum anticipated wellhead surface pressure.

Blowout prevention equipment will be automated with hydraulic actuating systems and accumulators of sufficient capacity to close all of the hydraulically operated equipment with the required minimum pressure remaining on the accumulator (working pressure of 5,000 psi). The equipment also has three manual locking devices with hand wheels extending outside of the rig's substructure.

The blowout prevention equipment schematic diagram will indicate the minimum size and pressure rating of all components of the wellhead and blowout preventer assembly. All blowout preventers, choke lines, and choke manifolds will be installed above ground level, as will casing heads. The equipment will have a ram type blowout preventers with one set of pipe rams and one set of blind rams.

The accumulator will have sufficient capacity to operate the blowout prevention equipment. Blowout prevention equipment controls will be located in the dog house.

In addition, a full opening drill string safety valve in the open position will be maintained on the rig floor at all times while drilling operations are being conducted. A kelly cock will be installed between the kelly and the swivel.

Using the returning drilling fluid, the automated mud logger and its supporting sensor system continuously survey the changing rock features, formation fluids, and temperature variations and is the first to evaluate the formation of gas and liquid entries that signals the penetration of high temperature/pressure conditions.

Design Standards

Well designs, barriers and cementing program were developed with the involvement of a registered Professional Engineer. The following design and testing standards were used for the plant systems:

Table 8-18. Design Standards

Component	Design Standards
Piping	ASME B31, API 5L
NDT Examination on Piping and Vessels	ASME B31, EN45001, EN473, EN12517, EN1712, ASME IX
Valves	ANSI
Materials	ASTM, DIN, EN
Civil	Eurocode, TEC2018, ASCE/SEI7-10, ICC-2009
Fasteners	EN898-1, ASTM A 193, ASTM A 194

Drilling Fluid

Sufficient drilling fluid materials to ensure well control will be maintained on site and readily accessible for use at all times in two mud tanks with a total capacity of 183 m^3. Mud testing and treatment consistent with good operating practice will be performed daily or more frequently as conditions warrant. Mud testing equipment must be maintained on the drilling rig at all times. In addition, there will be mud pit with a functioning alarm as well as high/low level indicators, degassers, and a solids control system.

The temperature of the drilling fluid going into and coming out of the hole will be monitored, read, and recorded on the driller's or mud log for a minimum of every 30 feet of hole drilled below the conductor casing; and a hydrogen sulfide indicator and alarm will be installed in areas suspected or known to contain hydrogen sulfide gas that may reach levels considered dangerous to the health and safety of personnel in the area.

Well Control

Before pulling drill pipe, the drilling fluid will be properly conditioned or displaced. The hole will be kept reasonably full at all times; and, in no event will the annular mud level be deeper than 100 feet from the rotary table when coming out of the hole with drill pipe. A mud logger and cooler will be utilized when necessary to maintain mud characteristics for proper well control and hole conditioning.

Wellhead Equipment and Testing

In order to complete the wells, all wellhead connections will be fluid pressure tested to the API or ASA working pressure rating (see Design Standards above). A certified welder using materials in conformance with ASTM specifications will perform welding of wellhead connections.

Completed wells will be equipped with a casing head with side outlets, a master valve, production valve, and an expansion spool. All equipment will have a temperature derated working pressure equal to or greater than the surface shut-in pressure of the well at reservoir temperature. Packing, sealing mediums and lubricants will consist of materials or substances that function effectively at, and are resistant to, high temperatures. Wellhead equipment, valves, flanges, and fittings will meet minimum ASA standards or minimum API Standard specifications in the Design Standards table above.

Supervision

From the time drilling operations are initiated and until the well is completed or decommissioned, a member of the drilling crew or the tool pusher will monitor the rig floor at all times for surveillance purposes, unless the well is secured with blowout preventers or cement plugs.

The operator will use all necessary precautions to keep all wells under control and use trained and competent personnel and properly maintained equipment and materials at all times.

8.8.4.2 Operation

During operations, wellheads and blowout prevention equipment will be properly maintained and inspected.

There are subsurface risks to casing due to corrosion and scaling. Design of the scale inhibiting program (including dosing, monitoring, and equipment) will be finalized once the long-term flow test has been completed. A well monitoring plan will be prepared once these final conditions are known (see monitoring section below).

Blowout prevention requirements during remedial work, redrills, recompletions and abandonments, in all geothermal wells, will be evaluated and provided for by the same process of consideration required in during new geothermal well drilling.

8.8.5 Emergency Response

In the event of a well blowout, response measures will require professional judgement; no operation will be undertaken if it involves risk to personnel. A process needs to be developed to respond to these emergencies, which needs to include:

1. Measures for protecting the personnel at the site in the event of a well control emergency

2. Notification protocols at the onset of a well emergency

3. Measures to prevent further damage or injury while adequate equipment and personnel are being mobilized

4. Defining the critical information that is required in order to determine the appropriate response level and strategies

5. Organizing personnel and providing guidelines for their roles during the emergency response and the subsequent management

6. Pre-selecting sources and developing mobilization plans for personnel, equipment, materials and services typically required for implementation of well control procedures

7. Notification of the appropriate regulatory agencies

In the event primary well control is lost, a series of escalating responses will be planned to regain primary well control by establishing borehole hydrostatic pressure above formation pore pressures:

It is very important to shut-in the well as soon as possible when uncontrolled flow is suspected. The steps will depend on the phase of the drilling activities (for example, while drilling, while tripping, or testing). Standard practices entail:

- The first response is to close the designated blowout preventer
- Ensure the choke is closed
- Open the choke line hydraulic opening valve
- Verify that the well is shut-in and the flow has stopped
- A detailed blowout response procedure and plan will be developed by the drilling contractor for submittal to NREI prior to initiation of the drilling activities.

8.8.6 Documentation and Monitoring

8.8.6.1 Construction

Testing

The results of all blowout prevention equipment pressure tests and function tests must be recorded with all available information including the type of test, testing sequence, low and high pressures, duration of each test, and results of each test.

Casing test results must be recorded in the driller's log and maintained after completion. The casing and lap test reports must give a detailed description of the test including mud and cement volumes, lapse of time between running and cementing casing and testing, method of testing, and test results.

The drilling contractor to NREI will submit all testing results.

Monitoring

The driller will monitor the drilling penetration rate and the drilling fluid circulation during drilling activities. The logger will monitor temperature variations, secondary mineralization and formation fluid entries. The temperature of the drilling fluid going into and coming out of the hole will be monitored, read, and recorded on the driller's or mud log. This information will be used to predict irregularities and risks and inform the drilling engineering and drilling supervisor immediately. All drilling and mud logs must also be maintained until completion of the Project.

8.8.6.2 Operation

During operation, wells need to be monitored for any warning signs of undesirable changes such as decreasing generating capacity due to lower pressure or flow, insufficient injection capacity, or possible operational problems such as scaling or corrosion in the wells or in the surface equipment.

Monitoring programs have to be specifically designed for each geothermal reservoir, because of their individual characteristics and the distinct differences inherent in the metering methodology adopted. Monitoring programs may also have to be revised as time progresses, and more experience is gained, e.g. monitoring frequency of different parameters. A monitoring program will be developed once more

information is known about the specific characteristics at the site. Below is a list of directly observable basic aspects included in conventional geothermal monitoring programs:

- Mass discharge histories of production wells (pumping for low-temperature wells).
- Temperature or enthalpy (if two-phase) of fluid produced.
- Water level or wellhead pressure (reflecting reservoir pressure) of production wells.
- Chemical content of water (and steam) produced.
- Injection rate histories of injection wells.
- Temperature of injected water.
- Wellhead pressure (water level) for injection wells.
- Well status through diameter monitoring (caliper logs), injectivity tests and other methods

8.8.7 Training

8.8.7.1 Construction

Prior to drilling activities, all tool pushers and drilling superintendents are required to have completed an API, IADC, or similar governing body sanction well control certification program. The certification must be renewed every two years.

While on site, a blowout prevention practice drill must be conducted weekly for each drilling crew and be recorded on the driller's log.

8.8.7.2 Operation

Frequent pit drills and mock well control drills will be planned and conducted for all plant personnel. Records of all training and drills will be maintained on site for as long as the personnel are employed.

8.8.8 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-19: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool/Frequency
Health and Safety	Employees must be in compliance with the training program (weekly)	100%	Construction and	Training Records / Weekly
Health and Safety	Employees must be in compliance with the training program (every six months)	100%	Operation	Training Records / Every six months
Health and Safety	Employees must be in compliance with the drills program and been instructed on incorrect actions and/or deficiencies.	100%	Construction and Operation	Training Records / Yearly
Health and Safety	Percentage of workers who have training on safety and emergency response.	100%	Construction and Operation	Training Records / Yearly

Health and Safety	Number of accidents and incidents	Zero incidents	Construction and Operation	Incident Reports / Monthly

8.9 Emergency Response Plan (Exploration and Exploitation Phases)

8.9.1 Introduction

This Emergency Reponses Plan details actions to be taken for an effective response in the event of the emergencies that could potentially be experienced by the Project, including physical accidents to personnel fires, and sabotage. This Plan defines the roles and responsibilities during an emergency response.

This Plan is a live document that will remain active during the life of the project, updates will be made to all aspects of the plan including training activities and periodic drills for personnel, as well as continuously carrying out actions to review and update physical and operational data, equipment and products.

This Emergency Response Plan is to be implemented together with the Natural Disaster Risk Management Plan and Contingency Plan. Note that Emergency Preparedness for the drilling operation is the responsibility of the drilling contractor and its subcontractors.

8.9.1.1 Objectives

The main objectives of this Emergency Response Plan are:

- Prevent or control operational emergencies or possible industrial accidents that may arise during the construction or operation phase of the Project.
- Establish procedures and plans to respond in a timely and efficient manner, and with the necessary resources, to fires, accidents, attacks and any other emergency that may arise.
- Prevent the consequences of a major event (fire, spills of dangerous products) from affecting human lives and property.
- Manage and maintain equipment and installations through periodic inspections.
- to provide a safe working environment, to determine the risks that could jeopardize the project and the personnel beforehand and to take all measures and be prepared for any possible emergency is adopted.

The basic principle of this plan is to foresee and carry out preventive actions by performing risk assessments with the intention of resolving emergencies at the source before they happen, to be prepared by performing drills and trainings, and by knowing that an emergency could happen at any given moment.

8.9.2 Roles and Responsibilities

All personnel are responsible for knowing how to apply this plan and working in compliance with all of the Project Plans. All site employees will know where the assembly points are and follow given. They will also keep access roads to the working areas open and unobstructed in case of emergencies. All personnel will be familiar with the occupational health safety and emergency response measures in the ESMP for this Project.

Emergency Response Team members will be selected among the personnel and roles will be assigned by their superiors prior to initiating any work at the Project site. The Emergency Response Team will be comprised of the roles and responsibilities described below.

Construction Site Manager (Construction) and Plant Manager (Operation) will be the Emergency Manager and they are responsible for:

- Appropriate implementation of this plan.
- Providing supplies and resources necessary for emergency response.
- Characterizing the level of the Emergency and therefore deciding who to call (fire brigade, ambulance, police, civil defense, etc.)
- Leading the Emergency Response Team until the local emergency organizations (fire brigade, ambulance, police, civil defense, etc.) arrives at the scene and takes over.
- Deciding if evacuations are needed.
- Gathering information on the number of injuries and the scale of the damage and harm on the equipment and assets.
- Ensuring that the required information is conveyed to Subcontractors.
- Reviewing and approving corrective-preventive measures in order to update this Plan.
- Communicating with NREI and the relatives/safety contacts of any affected personnel.

Deputy Emergency Manager (to be assigned by the Contractors during construction, Plant Superintendent during operation) is responsible for:

- Maintaining the Emergency Manager up-to-date.
- Taking charge if the Emergency Manager is not available or absent.
- Taking head counts and ensuring all personnel are accounted for and gather at assembly point.
- Verifying the safety of the site affected by the emergency.
- Carrying out the review of the emergency response once it has been completed and provides suggestions for corrective-preventive measures in order to update this Plan.
- Organizing requisite trainings for all personnel and maintaining documentation.
- Making arrangements for evacuations.
- Maintaining site personnel and contractors informed.
- Shuts power, controls lighting, sounds fire alarms, if necessary, during the emergency.

The Emergency Response Team (assigned by Contractor during construction, all site employees during operation) will be trained in fire extinguishing, search-rescue-evacuation and first aid, and are responsible for:

- Using a fire extinguisher if the fire is not severe and it can be done safely.
- Helping the Deputy Emergency Manager - to the possible extent - while keeping the emergency area safe until the local emergency organizations arrive at the scene.
- Supporting the local emergency organizations (fire brigade, ambulance, police, civil defense, etc.) during search and rescue activities.
- Assisting personnel reach the assembly point. If required, helping with evacuation procedures.
- To the extent possible, providing first aid and first aid equipment to the injured until medical personnel or ambulances arrive.
- Securing personnel and assets once the emergency is under control.

The Site Security Supervisor is responsible for:

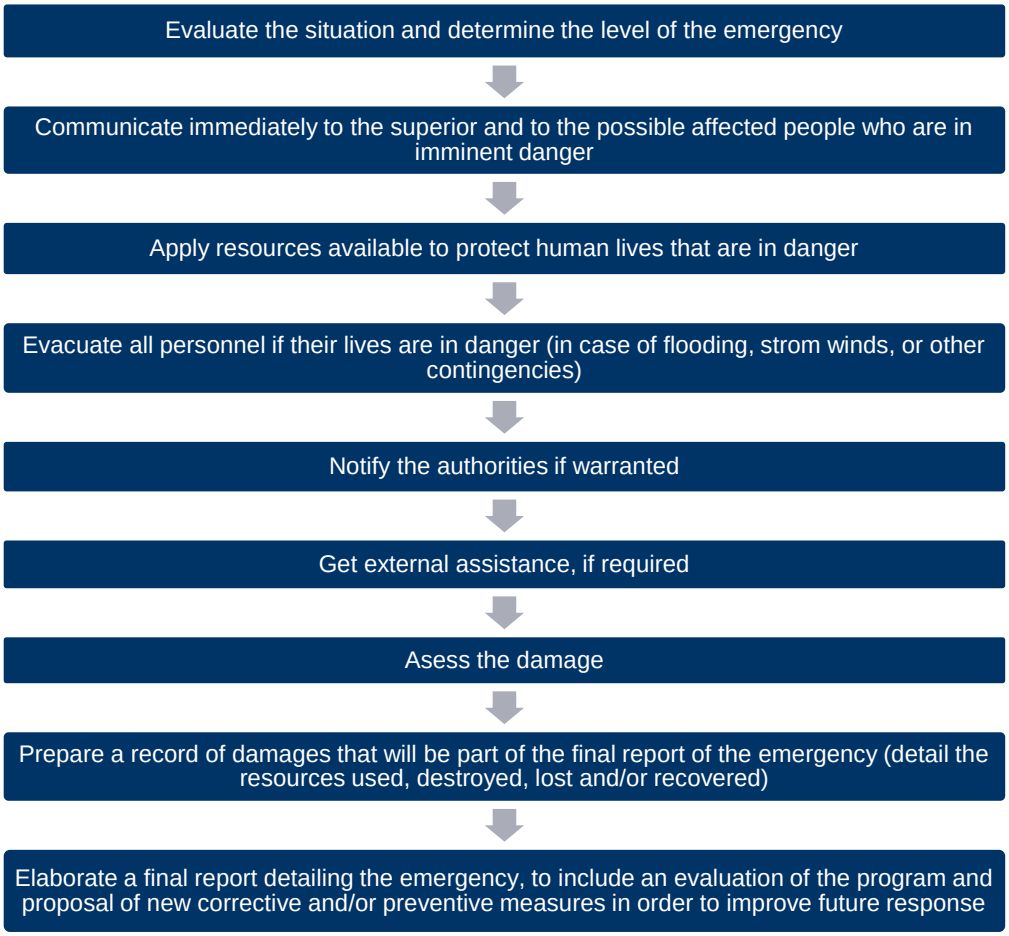
- Controlling the entry-exit gates of the site and only allowing emergency vehicles to enter.
- Helps local emergency vehicles access the scene.
- Directs traffic during emergencies

Subcontractors Managers while on site are responsible for:

- Ensuring the safety of their personnel and providing appropriate personal protective equipment (PPE) and training.
- Ensuring that all his personnel are accounted for and gather at the assembly point.
- Providing security of their area of responsibility.
- Providing emergency access to their working areas.
- Implements any corrective-preventive measures recommended by the Deputy Emergency Manager after an emergency response.

8.9.3 General Procedures

This Section describes the actions and procedures to be considered in case of emergencies and events that may arise. The general procedure in an emergency is presented in the following Figure.



Source: ERM, 2020

Figure 8-2: General Procedures During an Emergency

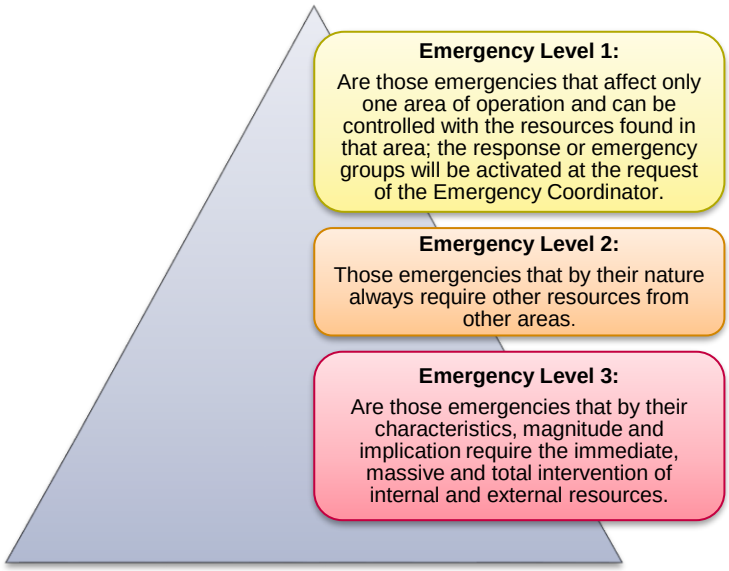
During construction, any contractor on site must lay out a sequence of actions to be followed in the event of an unplanned event or accident, which may be as follows:

- Notification: Inform all personnel of the accident.
- Verification and evaluation: Confirm that the notification provides an accurate representation of the status of the works and associated risk at the moment that the notification of the event is received.

Their notification scheme must include the information provided in this Emergency Response Plan (the main local authorities, the local police, and/or the local firefighters).

8.9.3.1 Emergency Levels

Prior to any response, it is important to first characterize the emergency by seriousness of the situation in order to apply the appropriate level of response, see figure below.



Source: ERM, 2020

Figure 8-3: Emergency Levels

8.9.3.2 Informing the Emergency

In case of emergency, witnesses to the incident will immediately inform the Emergency Manager by telephone or verbally. In addition to in this Plan, Emergency Communication Numbers will be displayed at the entry-exit gates of the site.

In cases when the informing is to be made verbally, the witness will immediately notify his superior or an authorized person. The witness should remain calm and be able to provide following information explicitly:

- Location,
- Type of incident,
- If an injury is of concern,

- Name of witness(es).

Together with the witness informing the emergency, the Emergency manager will investigate the emergency, set an order of priority according to the situation, inform the fire brigade, ambulance and public order team and NREI.

Calling Plan

The calling plan consists of three types of communications, internal, external, and support.

- **Internal Calls:** The internal calls include the communication of the emergency to top management personnel, as well as the members of the Emergency Response Plan who are outside the facilities.
- **External Calls:** Communication of the emergency to the appropriate Government Authorities, depending on the type of occurrence.
- **Support Calls:** Support personnel in order to control the emergency (dependent on the type), for example the fire brigade, the national police, ambulance service, medical attention if necessary, government authorities, etc.

Emergency Contacts

Internal Calls

The following table provides the contact information for the internal emergency contacts.

Table 8-20: Site Emergency Contacts

Role	Name	Contact Information
Construction		
Emergency Manager/Construction Site Manager	TDB	TBD
Deputy Emergency Manager	TBD	TBD
Emergency Response Team Member	TBD	TBD
Emergency Response Team Member	TBD	TBD
Emergency Response Team Member	TBD	TBD
Site Security Supervisor	TBD	TBD
Operation		
Emergency Manager/Plant Manager	TBD	TBD
Deputy Emergency Manager	TBD	TBD
Emergency Response Team Member	TBD	TBD
Emergency Response Team Member	TBD	TBD
Emergency Response Team Member	TBD	TBD

Role	Name	Contact Information
Site Security Supervisor	TBD	TBD

Note: To be determined prior to initiating construction and operation activities.

External and Support Calls

In case of emergencies, Emergency Services can be obtained by dialing the following numbers:

- Police: 911
- Medical Assistance: 911
- Fire Fighters: 333

The nearest hospital is Alexandra Hospital, which is approximately 2 km away. Upon exiting the Project site, turn right. This road becomes Government Road, and Alexandra Hospital will be on the right approximately 1.9 km away.

Alexandra Hospital:

- Address: Government Road Charlestown, Nevis, St. Kitts & Nevis
- Phone: +1 869-469-5473

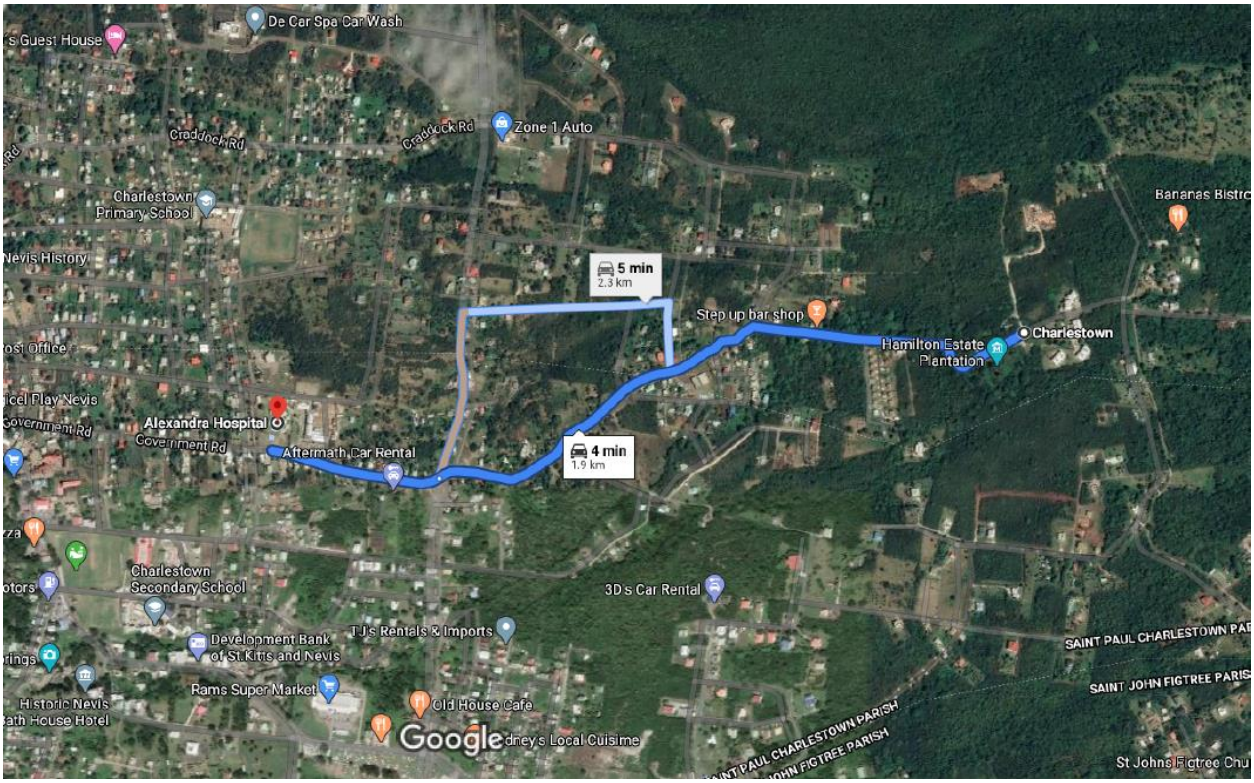


Figure 8-4: Map to Alexandra Hospital

Fire and Rescue:

- St. Kitts - Nevis Fire & Rescue Services (Nevis Division), located in Charlestown, Nevis
- Emergency Phone No. +1 869-469-3444

Nevis Police Force:

- Address: Main St Charlestown, Nevis, St. Kitts & Nevis
- Phone: +1 869-469-5391

The Office of Disaster Preparedness National Emergency Management Agency (NEMA)

- Address: Government Headquarters Church Street, PO Box 186 Basseterre, St Kitts
- Tel: +1 869 466 5100 / 6892
- Fax: +1 869 466 5310
- Email: NEMASKB@caribsurf.com

8.9.3.3 Prevention

The best way to control an event and the impact that these may have is to prevent them from happening by implementing preventive measures. General preventive measures are described below.

Personal Protective Equipment (PPE)

Personal protective equipment is mandatory. They will not prevent accidents, but will eliminate or reduce the severity of an injury. It is the responsibility of each contractor to provide their workers with the personal protection equipment required in the execution of any work that generates risks.

- The equipment will be new and of good quality.
- It is the responsibility of the immediate supervisor of each worker to determine the need for personal protective equipment and to ensure that the worker makes use of them.
- The worker will be responsible for the care, conservation and proper use of any equipment entrusted to him.

Organization and Order

During Construction, prior to the start of the work, the Contractor will develop a safety, organization and order program in order to provide guidance on everything from inspections to risk identification, to the types of waste/trash collection receptacles provided for the different types of wastes (organic, inorganic waste, solid waste, liquid, and hazardous waste). Transportation and final disposal method, in accordance with the national regulations, must also be included.

During Construction and Operation, the following organization requirements will be fulfilled:

- Employees will keep their work site clean and in good condition.
- The employee will notify his supervisor about spills of oil, grease, etc., and they will be cleaned as soon as they occur.
- All tools, screws and any other material equipment used in the performance of a job will be kept in order, and these objects will not be placed in places where they can be dangerous.
- The flammable substances and wastes will be handled and stored accordingly in order to avoid the risk of spontaneous fire.

- There will be a staging area or adequate space for orderly storage of bulky objects, equipment, or materials.
- Every workplace will be provided with fresh and potable water in sufficient quantity for workers to use.
- The toilets and bathrooms (at least one toilet for every 20 workers) will be kept in optimal conditions and with sufficient supply of toilet paper, water and soap.
- The workplace will have a dedicate area for eating, protected from weather elements. No waste and debris will be left in place.

Training

Every worker, new or old, will receive operational training from their immediate supervisor in order to develop knowledge and skills for the safe execution of the assigned work, especially on:

- Industrial safety corresponding to construction.
- Occupational health.
- Fire Prevention.
- First aid.
- Personal protective equipment.
- Organization and order.
- Accident prevention.
- Accident analysis.
- Fire protection.
- Emergency control.
- Factors of physical risks (electrical, mechanical, noise and vibrations, lighting, heat, ventilation, etc.)
- Factors of chemical risks (smoke, gases in the environment (vapors, fumes), toxic, alkaline and corrosive substances, etc.)
- Other risk factors (health, third-party actions, environmental, etc.).

8.9.3.4 Evacuation and Assembly Points

If an evacuation is required during an emergency, the decision to evacuate will be made by the Emergency Manager and will be communicated by both telephone and verbally. After notification, supervisors will be responsible for spreading news of the emergency to the workers that they are in charge of and will direct them to the assembly point.

During an emergency, all work will be stopped at the affected area.

During Construction, an assembly point will be designated at the construction site in an open area with visible signs. Information on this location will be provided to all personnel during their initiation training. If there are any changes, the plans must be updated and all personnel must be informed.

In case of an emergency, the Deputy Emergency Manager will do a head count to ensure that all personnel have gathered at the assembly point. They will in turn notify NREI.

All access roads will be kept clear of equipment or goods so that the personnel can evacuate the area safely and effectively in case of emergencies. Walkways and building hallways/entry ways will also be kept clear.

Emergency lighting will be placed at the access routes. Buildings will be provided with evacuation maps and site layout plans. Supervisors will ensure the safe evacuation of any disabled personnel.

8.9.4 Types of Emergencies

The types of emergencies that may arise in the Project area are classified according to their origin:

- Operational emergencies or incidents normally caused by operations, fires, falling machinery, etc.
- Industrial accidents of personnel or contractors, normally caused by unsafe acts, unsafe conditions or as a consequence of the natural phenomena or operational emergencies previously stated.
- Social phenomena such as sabotage, terrorism, robberies, etc.
- Natural phenomena, such as earthquakes, hurricanes, etc. (covered under separate Plans).

8.9.4.1 General Emergency Response Actions

General emergency response actions include:

- Upon receiving notice of an emergency, the Emergency Manager will immediately evaluate the level of emergency and determine which response measures are necessary, notifying the corresponding response groups.
- If necessary and in accordance with the magnitude of the event, the Emergency Manager will order the evacuation of the area or facilities and initiate the respective response procedures.
- The Emergency Manager will notify the relevant authorities.
- If necessary, consult the emergency response procedures in order to verify the appropriate response for each emergency, ensure all the response procedures have been applied and record descriptive information of the event.
- Restrict access to the event area.

Communications must be made by cell phone or portable radio transmitters.

8.9.4.2 Spills

Equipment and Materials Needed for Spill Response

The following materials will be maintained on site to deal with spill incidents:

- Absorbent material, such as sand, sawdust, absorbent cloths (depending on spilled material).
- Barriers or sand bags to prevent the spread of a spill.
- Pumps to remove spilled substances from inside ditches or pits.
- Safety equipment such as gloves, respirators (if necessary), plastic aprons, goggles, and boots.
- Appropriate containers for the collected material.
- Photographic camera to document the incident.

Procedures

The procedures to respond to a spill depend on the type of substance, location and quantity spilled. A list of chemical types will be maintained on site (solvents, gasoline and similar combustible/flammable, abrasive, toxic, explosive chemicals that are stored collectively) to include their amounts and corresponding Material Safety Data Sheet (Safety Data Sheet - SDS). All materials will be labeled accordingly in order to determine the dangers/risks of each chemical, as required by the Hazardous Materials Management Plan. Material handling procedures will be instructed to all personnel during their initiation training and during their training updates.

In case of a spill, the impacted area will be closed off an only trained response team personnel with the proper personnel protective equipment will be allowed to enter. If it is safe to do so, the source of the spill will be stopped (via shutting-off valves, lowering of the pressure of the tanks, transferring the product, patching or plugging the source of the spill or absorbing the spill using the appropriate absorbent materials.

The Emergency Manager will decide on the need for notifying external emergency response (for example the fire brigade or NEMA), depending on the type, volume, impacted resource (for example, soil or environment) and the magnitude of the impact.

8.9.4.3 Fires and/or Explosions

A fire can lead to serious damage to equipment or personnel, and will be taken care of as quickly as possible. The following measures will be taken in case of a fire.

Equipment

Equipment to controls fires (such fire extinguishers, hydrant system, pickaxe, shovel, hook, etc.) will be maintained on site. Inspections ad inventory of the equipment will be performed every two months and documented on site. In addition:

- Fire extinguishers will be placed at every location where hot works are being performed, near storage areas and flammable materials, and inside all buildings. The site will be equipped with multiple types of extinguishers that work in different environments depending on the type of project (for example, Class A extinguishers for ordinary combustibles such as wood and paper, Class B extinguishers for use on flammable liquids like grease, gasoline and oil, etc.).
- Fire panels containing control tools will be placed at a central location of the construction site.
- Fire extinguishers will be found at the heavy machineries and they will be checked monthly.

Before a Fire

- All personnel will be trained through courses on fire practices and simulations of accidents, use of fire extinguishers, etc.
- Rigorous preventive maintenance programs will be implemented for all types of equipment, including inspecting and recharging fire extinguishers, etc. Extinguishers will be kept in good condition.
- Safe areas will have signs and evacuation routes will be established in all facilities or work fronts.
- First aid kits, battery-operated flashlights, extra batteries, etc. will be maintained on site at the construction areas, all facilities (including the security building), and work areas.

During a Fire

- Evacuate and or stop work in the area and / or facilities.

- Communicate with the local Fire Brigade, National Police and other entities depending on the severity of the emergency.
- Protect mouth and nose with damp cloths.
- Keep calm and avoid running.
- Assist affected people immediately, if any.
- If appropriate, try to put out the fire with the use of extinguishers and other existing means. Ensure extinguishers are periodically inspected to ensure they are in working condition.
- If any equipment is involved in the fire or explosion, the operator must manually disconnect the electrical power that feeds the equipment, as long as it can be done safely or without risk to human life.

In the event that the fire cannot be fought directly with the extinguishers, or there is danger to the personnel, the actions to be taken are:

- Notify firefighters immediately for help.
- Evacuate to the assembly place as directed during the training and drills.
- Once the firefighters have determined that the emergency has ended, the Emergency Manager and NREI will be notified.

After a Fire

- Clean the affected area.
- Remove all debris.
- Repair and / or demolish affected facilities in case of major damages.
- When the fire has been extinguished, proceed with the maintenance crew to prepare an inventory of damages and then make a detailed report on the matter.

Adequate Staff Training

Practices or simulations will be carried out every six months (can include coordination with the local Fire Department), and will include response procedures for all personnel.

Use and Disposal of Fire Extinguishers

- Fire extinguishers will be located in appropriate places and will be easily accessible.
- Every extinguisher will have a plaque with the information about the kind of fire for which it is suitable and its expiration date. Also, they will have operation and maintenance instructions.
- Each extinguisher will be inspected every two months, tested and maintained in accordance with the manufacturer's recommendations; similarly, they must carry a label with test dates and expiration date.
- If an extinguisher is used, it will be refilled immediately; or if necessary, it will be replaced immediately.

8.9.4.4 Falls from Heights, Cut Wounds, Electrocution and Burns

Equipment

Firs aid kits and stretchers will be maintained on site during construction and operation of the project. They will be easily accessible with signs showing their locations. These will be inspected every two months.

Before

- Training for personnel will include industrial safety so that they do not commit unsafe acts and use the appropriate protective equipment, such as a helmet, boots, safety glasses, restraint harness, etc.
- Personnel will be trained in the implementation of first aid, so that they may help injured coworkers or themselves, until the arrival of medical or paramedical personnel to the place of the accident or their transfer to a hospital for professional attention.
- All personal will be provided with the appropriate protection equipment depending on their work. During construction, Contractors will be required to provide their own employees with the appropriate equipment to perform their work tasks safely.

During

In case of an accident, the staff will act as follows:

- If it is a minor accident, apply first aid to the injured person and transfer them immediately to the nearest clinic or hospital so that a doctor can see them, in order to rule out possible after-effects.
- If it is a serious fall from heights, shelter the injured person and request an ambulance for immediate transfer to a hospital.
- If a person is not breathing, provide rescue breathing (mouth-to-mouth breathing or mouth-to-nose) and request an ambulance for urgent medical attention.
- In case of burn, do not apply home remedies to the injured only water if it is a minor burn and request an ambulance for transfer to the clinic or hospital as soon as possible.
- For hemorrhage from a puncture wound, hold a gauze in place to avoid blood loss. If located in the extremities, make a tourniquet to cut blood loss, loosening the tourniquet every 10 minutes to avoid gangrene and move the injured person to safe location.
- If trapped with weight on the chest, lever the heavy element and remove it so that the victim does not suffocate, until the arrival of the ambulance.
- If the victim has suffered an electric shock, first ensure there is no other risk of electrocution, then ensure they are breathing, provide rescue breathing (mouth-to-mouth breathing or mouth-to-nose), and simultaneously request medical assistance or transfer to a clinic or hospital.

Immediate attention to an injured person through knowledge of First Aid can save a life. Always seek the appropriate medical attention by a professional.

After

- Analyze the causes of the accident and the actions taken to assist.
- Prepare the preliminary and final report of the industrial accident.

8.9.4.5 Equipment or Infrastructure Failure

- The person who detects a fault or failure will immediately notify the Emergency Manager, identifying themselves and indicating the place and type of emergency.
- Try as much as possible to isolate the area or prevent vehicles or people from approaching.
- After overcoming the problem, analyze the root cause of the emergency/fault or failure.
- Prepare preliminary and final reports and submit to the appropriate authorities in a correct and timely manner.

8.9.4.6 Well Blowout

The Contractor will prepare a Well Blowout Response Plan prior to the start of drilling activities based on the final design of the wells and the well blow out equipment. The objectives of the Well Blowout Response Plan will be to:

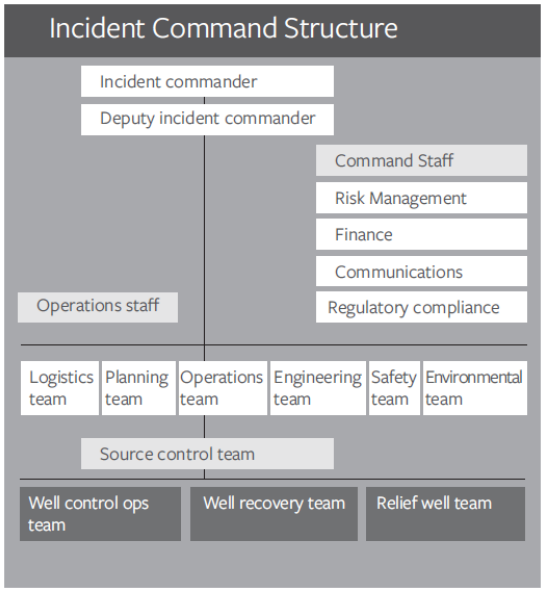
1. Protect the personnel at the site in the event of a well control emergency
2. Define the notification protocols at the onset of a well emergency
3. Prevent further damage or injury while adequate equipment and personnel are being mobilized
4. Define critical information that is required in order to determine the appropriate response level and strategies
5. Organize personnel and provide guidelines for their roles during the emergency response and the subsequent management
6. Pre-select sources and develop mobilization plans for personnel, equipment, materials and services typically required for implementation of well control procedures
7. Notify the appropriate regulatory agencies and/or community liaisons

This Well Blowout Response Plan must include both the construction and operational phases of the Project with clear instructions on:

- Shutting-in the well: It is very important to shut-in the well as soon as possible when flow is suspected. Well shut-in procedures will be provided for the different phases including during drilling, while tripping, or while in operation.
- Response levels based on differing scenarios such as well kicks, loss of circulation, loss of equipment integrity, surface leaks, surface blowout, underground blowout, surface pressure beyond equipment rating, and any other situations that constitute a clear and present danger to personnel, environment or equipment that cannot be resolved via conventional means.
- Equipment needed such as:
  - Drawworks
  - Top drive
  - Mud pumps
  - BOP hoists
  - Air/hydraulic winches
  - Hydraulic chokes

- BOP accumulator charge pumps
- Iron roughneck

- Immediate response actions such as evacuating rig personnel, shutting down fired equipment, establishing safety zones, identifying hazardous materials on-site, monitoring well conditions, and implementing pollution abatement measures.
- The incident command structure organization, such as:



Source: WWC, 2013[113]

Figure 8-5: Sample Well Blowout Incident Command Structure

- Interim action plans
- Evacuation of area population
- Response methodology and intervention activities to include diversion or kill operations.
- Any additional equipment requirements and where they will be furnished from (local sources).
- Site safety plan with the following elements:
  - Site description and identification of site's zones (hot, warm and safe zones)
  - Site hazards (physical, chemical, toxic/gas hazards)
  - Personal protective equipment (PPE) requirements
  - Site access, check-in points, communications (safety channel designation on radios, alarms, emergency medical services, environmental monitoring services required)
  - Safety meeting schedules and safety drills
- Hazard assessment

[113] Wild Well Control, Inc. and Travelers, Well Control Emergency Response Plan, Oil and Gas, U.S. Oil and Gas Land Operations, 2013. https://www.travelers.com/iw-documents/business-insurance/og-emergency-resp-plan-cp-7529.pdf

- H_2S operations (if needed)
- Communication/PR plan
- Relief well considerations
- Emergency contact information, and
- Well control forms

It is important to note that no operation will be undertaken if it involves risk to personnel.

8.9.4.7 Attacks and Sabotage

In order to prevent attacks and sabotage, the site will:

- Provide strict control of the entry of personnel into the facilities by use of security personnel, as well surveillance in strategic areas, as necessary.

In the event of an attack or sabotage, the person who detects it will immediately notify the Emergency Manager of the emergency, indicating the place and equipment affected.

- The shift leader will immediately inform the Police and personnel in charge of the surveillance of the facilities, to neutralize the aggressors.
- If an attack leads to an emergency event (such as a spill or fire), the response strategy to the specific type of emergency will be determined and instructions will be given to the external support units: police, fire brigades, etc.
- Prepare preliminary and final reports and submit to the appropriate authorities in a correct and timely manner.

8.9.5 Drills and Training

8.9.5.1 Drills

Drills will be conducted every 6 months to ensure all employees know how to respond to an emergency and to rate the efficiency of this Emergency Response Plan. Personnel will be reminded of their duties and responsibilities before the drills. The drills will be conducted without notice and the response times will be monitored and recorded.

After the drills,

- If any issues or faults in behavior are encountered, then additional trainings will be organized to resolve these issues.
- Any other impediments, if any, will be corrected via corrective actions and additional instructions,

The Emergency Response Plan will be revised considering the results of the drills and the improvement suggestions of the Emergency Manager and Deputy Emergency Manager if any deficiencies are encountered.

8.9.5.2 Trainings

The emergency response team will be trained on the contents of the Emergency Response Plan and their responsibilities during an emergency will be explained to each team for their concurrence. Emergency response team members contact information is provided in **Section 9.8** of this Emergency Response Plan

as well as their signatures to ensure they understand their roles and are in agreement. The team will get refresher trainings every six months in all cases.

8.9.6 Evaluating and Reporting

The existing plan will be revised when modifications are required to any of the items detailed above. Modifications can be due to any of the following conditions:

- Deficiencies during drills,
- Amendments to regulations or regulatory requirements,
- The occurrence of serious accidents or incidents,
- Changes to the risk assessments,
- Changes in Project technologies, procedures, methods, materials or equipment,
- Any other unforeseen circumstance.

Even without any of the above, the Emergency Response Plan will be reviewed and updated every 6 months and updated if any changes are warranted.

All emergencies will be recorded and reported. If an emergency occurs, once the emergency is under control the Emergency Manager will begin the inspection process of the scene and document the following via written records to be maintained on site:

- Place of emergency,
- Date, hour and duration of emergency,
- Description of the emergency,
- Impact of the emergency (damage on personnel and assets),
- Measures to be taken and operations to be performed to continue the work,
- People responsible for the response measures and operations.

The reasons for every reported incident will be investigated and recommended corrective and preventive actions will be implemented. Any statistics and risk assessments from the accident-incident reporting will be used to develop a proactive approach to prevent these emergencies from re-occurring.

8.9.7 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-21: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool/ Frequency
Health and Safety	Employees must be in compliance with the training program (every six months)	100%	Construction and Operation	Training Records / every six months
Health and Safety	Employees must be in compliance with the drils program and been instructed on incorrect actions	100%	Construction and Operation	Training Records / every six months

	and/or deficiencies (every six months).			
Health and Safety	Percentage of workers who have training on safety and emergency response.	100%	Construction and Operation	Training Records / Yearly
Health and Safety	Number of accidents and incidents that have required the activation of emergency protocols.	Zero incidents	Construction and Operation	Incident Reports / Monthly

8.9.8 Emergency Response Quick-Look Up Tables

The Tables below can be used in the Emergency Response Plan for quick look up. Individuals names will be determined prior to initiating construction and operation activities.

Emergency Manager

Name	Duty	Training	Telephone	Signature
		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		
		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		

Emergency Response Team

Name	Duty	Training	Telephone	Signature
		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		
		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		
		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		
		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		
		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		

		☐ First Aid ☐ Fire Extinguisher ☐ Spill Control ☐ Well Blowout		

Incident Communication

Title	Name	Telephone
Site Manager/Emergency Manager		
Deputy Emergency Manager		
Site Security Supervisor		
Ambulance		911
Fire		333
Police		911

Information Required

- Name of Informant
- Place/Location of Incident
- Time of Incident
- Incident Type
- Number of Injured/Affected
- Condition of Injured/Affected

8.10 Security Management Plan (Exploration and Exploitation Phases)

8.10.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

The Security Management Plan will assure an effective protection of people, assets, and operations of the Project, in accordance with the Human Rights principles, and minimizing any possible impact on local communities.

8.10.1.1 Objective

The objective of this plan is to establish and define the guidelines that guarantee the protection and Security of the assets and personnel involved in the execution of NREI's projects and activities.

8.10.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during projects' life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.10.2 Roles and Responsibilities

In order to properly implement the Labor Conditions and Workers Selection Plan, NREI requires the involvement of the people listed below.

Table 8-22: Roles and Responsibilities

Role	Responsibilities
CEO	■ Review and approve the Security Management Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Security Management Plan.
ESG Manager	■ Ensure the correct implementation of the Security Management Plan. ■ Review and approve the contractor project-specific Security Management Plan.
H&S Manager	■ Ensure the correct implementation of the Security Management Plan.
EHS Representatives[114]	■ Help with the implementation of the Security Management Plan.
Head of Security	■ Manage the security personnel, implement, update and monitor the Security Management Plan.

[114] The EHS Representative will be the main authority on the Project site in charge of Environmental Health and Safety (EHS).

Security Personnel (Guards, Drivers, etc.)	■ Understand and carry out the activities set out in the Security Management Plan. ■ Develop their work in compliance with all applicable regulations regarding respect for Human Rights. ■ Know how to proceed with complaints and / or claims of interest groups and local communities.
Contractor Company	■ Develop a project-specific Security Management Plan aligned with this Security Management Plan.
NREI's employees, contractors and subcontractors	■ Understand and carry out the activities set out in the Security Management Plan.

Source: NREI, 2020

8.10.3 Activities

At the beginning of the Project, NREI must identify potential risks or impacts related to physical security, by using the Risk and Impact Identification process, and determine the level of risk of each situation.

The following are the most common situations that NREI may face during a Project development:

- Material/equipment robbery;
- Presence of unauthorized personnel in the Project;
- Entry or intrusion of personnel within restricted areas;
- Conflicts between workers; and
- Conflicts between Project's workers and local communities.

To prevent this type of risks and impacts from occurring, there are some measures that can be carried out in the NREI Project:

- Security services;
- Access Control Service for workers, machinery, suppliers, and external visitors;
- Surveillance rounds;
- Communication system with the security service and the police.

These activities may change depending on the results obtained in the risk analysis. When required, these criteria will be included as contractual measures.
Risk and Impact Identification and established prevention / mitigation measures will be reviewed periodically or when there are relevant changes, in order to ensure sufficient protection throughout all phases of the Project's life cycle.

For cases in which this type of situation cannot be prevented, there will be specific (and confidential) procedures for action by workers with Security responsibilities, which favor the control of said situations and minimize their possible conditions.

There will be total coordination between the workers responsible for NREI's Security and the Local Authorities. If necessary and depending on the circumstances, NREI may require assistance from Local Authorities, and vice versa. Any incident related to Security must be reported and investigated to analyze its possible causes and avoid its recurrence in the future.

8.10.3.1 Site Security

In order to provide security, NREI will fence the entire parcel and construct a security guard facility at the entrance gate. Additional security generally consists of cameras and perimeter monitoring by security. NREI plans to maintain the existing trees, shrubs, and dense vegetation along the northern, eastern, and southern site boundaries and the potions of the plant site not necessary for the plant, brine pond, and production well pad. The 2.1-acre area north of the plant equipment and the area surrounding the production well pad will be maintained as vegetative screening.

8.10.3.2 Recruitment for Security Personnel

To assure that the Security Personnel working for NREI is aligned with best international practices, the hiring Security Personnel and their performance, will need meet the following criteria:

- Security Personnel will have full understanding of NREI's Safety, Health, Environment and Social Standards, NREI's Code of Conduct, the Basic Principles on the Use of Force and Firearms by Law Enforcement Officials (United Nations) and applicable local legislation in this matter.
- Security Personnel will require to present a completed Use of Force and Human Rights Training certification before they begin to work at the Project.
- Security Personnel will show professionalism in managing expectations and concerns in conflicts in which local communities may be affected.
- NREI will not hire as Security Personnel any individual who has been involved in cases of abuse of Human Rights.
- Security Personnel will comply with the confidentiality agreements for sensitive information to which they will have access due to their employment position.
- NREI will provide the necessary material resources to ensure that prevention and defense work strengthens the necessary levels of physical security.
- The performance of the Security Personnel will be monitored, corrective actions will be identified and lessons learned will be implemented.
- An investigation (documented and registered) will be carried out by NREI of any abusive situation or in which the previously cited principles have been breached. Such cases will entail the necessary disciplinary measures.

It is important to mention NREI will hire at least four people for the position, two for each shift. One for the site and the other for the laydown area. Both will be 12 hours shifts. Security personnel must have knowledge of the Internal Grievance Mechanism and their labor rights/conditions at all times. NREI labor conditions are aligned International Finance Corporation (IFC) Performance Standard (PS) 2.

Human Rights and Use of Force Training

All security personnel working on the Project will be required to provide a completed human rights and use of force training certification before starting to work at the Project. The Project aims to maintain a work environment that values the respect for human rights and the treatment with fairness and dignity of all people involved in the Project, as well as the external stakeholders. The training will include subjects such as appropriate conduct in different security scenarios, lawful use of force and use of less lethal weapons, and if applicable, the use of firearms. The Project does not expect to have armed security guards, however, this training will still be compulsory for all security personnel.

Instructions will emphasize that "security personnel are permitted to use force only as a matter of last resort and only for preventive and defensive purposes in proportion to the nature and extent of the threat, and in a manner that respects human rights" (IFC, Guidance Note 4). For example, security guards will refrain from verbal or physical harassment of any kind. Lethal force will be used only where other means are unsuccessful, and only to protect human life.

Training programs can be provided by the Project, the security provider, and/or qualified third parties (or a combination of these). When training is designed and delivered by contractors, the Project will periodically review the training agenda, materials, attendance log, and other aspects of the training, and the Head of Security will also attend a training session. The human rights and use of force training certification will be required before starting to work in the Project and a re-fresher training will be required on a yearly basis.

The Human Resources Manager in collaboration with the Head of Security will keep records of all the security guards on site and the necessary documentation proving the training completion (training certificate, specific training curriculum and date of completion).

8.10.3.3 Training and Information

In addition, employees with Security responsibilities (Guardians, Drivers, etc.) will receive specific training in order to ensure that the response to any dangerous situation is adequate.

These trainings will consider social aspects and respect for Human Rights. Emphasis will be placed on the identification of stakeholders and local communities, their expectations and possible concerns and the associated potential risks.

In addition, Employees with responsibilities in the field of physical security will understand the External Grievance Mechanism Plan to act on it in cases where they interact as a point of contact between the local communities' members and the Project.

8.10.3.4 Security Guard Functions

The main functions of NREI's Security Personnel is to ensure and safeguard the Project facilities, as well as material goods of any kind, along with:

- Reduce the possibility of equipment subtraction, deterioration or improper use.
- Control at all times the entry and exit of staff and guards to the site.
- Manage the existing protection systems (fire detection, surveillance and security systems, alarms, etc.);
- Collaborate in evacuation, alarm, firefighting, first aid, transportation of wounded and intervention, etc.
- Immediate communication with Project supervisors and local authorities in case of an incident (the security guard must always have the phone numbers or contact information to communicate the emergency in a timely manner);
- Control the entry and exit of vehicles in access control; and
- Control of badly parked vehicles.

8.10.3.5 Site Access Control

For access to the facilities or sites, workers, contractors and visitors must wear an identification badge in a visible place during their stay.

The identification badge must have at least the following information:

- Name of the company;
- Full name of the employee or in the case of visit must be indicated on the badge;
- Number or validity of the badge; and
- Photograph.

The ESG Manager is responsible for coordinating with the Security Personnel the access of contractors, visitors and workers to the Sites.

During the days when there are no assigned tasks or maintenance routines, personnel will not be allowed access to the sites. Access to any person who intends to sell or promote any item or service within the NREI Sites or facilities is prohibited.

8.10.3.6 Additional Measures

For security measures regarding unplanned events and emergencies at the Project, see NREI's Emergency Management Plan. Furthermore, below are some security related additional measures applicable to NREI's employees, contractors, subcontractors, service providers and visitors to ensure the physical safety of the Project, these measures will be communicated and monitored by the ESG Manager.

- Smoking is prohibited at all the NREI Installations.
- The entry of weapons is not allowed.
- The introduction, possession and/ or consumption of alcoholic beverages, drugs or narcotic or psychotropic substances on the Project's sites, as well as access to people to the site under their influence is strictly prohibited.
- When noticing any unsafe conditions, the person of the highest rank on the site must inform the EHS Representative.
- Workers or any other people from the Project will not be allowed to carry out any activity if they are not authorized and trained.
- The areas must be kept clean and free of objects that impede the work.
- The EHS Representative will be informed of any people or vehicles outside or outside their work area.
- Al Project staff will be asked to stay alert to unsafe conditions, correct them and notify them immediately.

8.10.4 Documentation and Monitoring

The Head of Security will keep evidence and will be maintained through the logbooks and minutes of the meetings, and other applicable documents.

8.10.5 Key Performance Indicators

The Security Management Plan is to be reviewed on a six-month basis for the initial two years and then annually or as necessary in consultation with the Head of Security. The Project will ensure that contractors update their procedures at least once every six months during the first two years and then annually or as needed.

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-23: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Security Incidents (internal and external)	Number of security incidents per quarter (involving workers)	Zero security incidents If security incidents occur, 100% of the incidents should be reported (including how it was solved, lessons learnt and corrective actions).	All phases of the Project	Head of Security's Records and Reports, in coordination with Contractors / per quarter
	Number of security incidents per quarter (involving community members of other external stakeholders)	Zero security incidents If security incidents occur, 100% of the incidents should be reported (including how it was solved, lessons learnt and corrective actions).	All phases of the Project	External and Internal Grievance Mechanism / per quarter
	Number of grievances from the community related to security at the Project	100% grievances regarding security concerns addressed and solved in a timely manner	All phases of the Project	
Security Trainings	Security personnel trained at the Project (human rights and use of force trainings)	100% of trained security personnel before starting to work at the Project and re-fresher training on a yearly basis	All phases of the Project	NREI Human Resources Training Records / Yearly
Inspections	Number of inspections per quarter	At least one internal security inspection will be carried out each quarter	All phases of the Project	Head of Security's Records and Reports, in coordination with Contractors / Quarterly

8.11 Workers Health and Safety Management Plan (Exploration and Exploitation Phases)

8.11.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

To promote its projects alignment to best international practices, NREI acknowledges that health and safety measures are an essential part of the management of any project, in order to ensure the wellbeing of its workers directly and indirectly involved in its activities. The Worker Health and Safety Management Plan (WHSMP) has been compiled to address the specific impacts and risks that are anticipated during the different phases of the Project. This plan sets out a formal system by which NREI can manage and implement mitigation measures that will avoid or reduce the significance of impacts related to worker health, safety, and security.

8.11.1.1 Objective

The objective of this plan is to establish health and safety conditions for the NREI Project, with the aim of preventing occupational risks of NREI personnel, contractors and subcontractors. More specifically, this plan intents to:

- Align with international best practices, which could facilitate international lenders participations in Project financing;
- Protect the health and safety of all workers and employees of the Project;
- Be proactive in identifying risks and activities that may affect the health and safety of workers;
- Prevent accidents and incidents due to the activities of the Project;
- Define the roles and responsibilities for implementing this Plan; and
- Define the monitoring, reporting, and intervention/adaptive management procedures for the Plan.

8.11.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during the Project's life cycle (construction, operations and decommissioning). It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

The WHSMP is applicable across the entire workforce at all skill levels, and deals with all aspects relating to the employees of NREI and its contractors. The WHSMP includes measures related to the management of workers engaged by third parties, and also the management of workforce related risks within the supply chain. All activities to be performed on site must be carried out under good conditions of health, safety and environment considering the risks associated with each activity as well as the social needs and requirements. The physical safety of the workers, installations, surrounding properties and environment must be maintained.

NREI's ESG Manager, Human Resources Manager and General Construction Manager shall have an updated copy of this plan and the specific details will be communicated to other employees during specific training.

This plan shall be distributed to all contractors / subcontractors / service providers / suppliers, and it shall be included in all contractual documentation and used as a basis for all specific WHSMPs to be prepared by all engaged parties. Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific Environmental and Social Management Plans (ESMP) will be applied on the ground. NREI will review and approve this document before any implementation.

8.11.2 Roles and Responsibilities

In order to properly implement the Workers Health and Safety Management Plan, NREI requires the involvement of the people listed below.

Table 8-24: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Workers Health and Safety Management Pan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Workers Health and Safety Management Pan.
Head of ESG	■ Be familiarized with the Workers Health and Safety Management Pan.
ESG Manager	■ Assure the correct implementation of the Workers Health and Safety Management Pan. ■ Update the Workers Health and Safety Management Pan. ■ Review and approve the contractor project-specific Workers Health and Safety Management Plan.
H&S Manager	■ Assure the correct implementation of the Workers Health and Safety Management Pan. ■ Ensure the generation of evidence and reports for compliance with the IFC PS as well as maintaining NREI's KPIs.
Contractor Company	■ Develop a project-specific Workers Health & Safety Management Plan.
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Workers Health and Safety Management Pan.

Source: NREI, 2020

8.11.3 Activities

This plan describes the actions that need to be taken to avoid or manage potential impacts associated with Occupational Health and Safety (OHS) issues, which may arise from activities related to the Project. NREI will establish preventive and control measures in line with international best practices, such as the International Finance Corporation (IFC) Performance Standards.

Health and safety is an important objective of the Project. Injuries, occupational health and safety, and environmental incidents are preventable; thus, NREI's goal is to have zero incidents. NREI will also encourage employees to adopt a safe, healthy lifestyle for themselves and their families. In order to achieve this, the following main requirements have been defined:

- Zero harm to people or the environment;
- NREI's ESG Manager is responsible for providing strong, visible leadership and commitment to maintain the WHSMP;

- OHS is of equal importance to Project production, economy and quality;
- All employees of NREI/ contractors/ subcontractors / service providers / suppliers must follow the same H&S and/or OHS philosophy;
- NREI must establish a high standard of H&S and OHS to promote motivation and efficiency;
- Maintain a low risk level in all activities as far as reasonably possible; and
- Maintain an updated, comprehensible and efficient WHSMP.

This document shall be read in conjunction with all valid NREI Management Plans, Policies and other applicable documents.

8.11.3.1 Risk Identification and Analysis

Risk identification and analysis is part of the pre-work planning process. The purpose of this activity is to ensure that the risks associated with the Project activities are clearly understood and properly managed.

Project Identification

H&S Manager must assure that each component of the Project has a description for the risk identification, this description contain at least the following information:

- Project's component name;
- Type of project (e.g. geothermal plant, transmission line, etc.);
- Project capacity;
- Project localization; and
- Basic infrastructure of the Project (including transmission lines).

Risk Identification

The H&S Manager will be responsible of identifying and classifying all the activities and sub activities carried out in the Project, some examples of activities can be:

- Supply and installation of equipment and materials,
- Work on site,
- Structures, wiring, control and monitoring systems, safety systems, etc.

Risk Analysis

After the identification of risks, the evaluation is carried out. This evaluation allows risk prioritization according to severity and probability levels, with specific controls being defined for those risks that are considered significant in order to reduce them to an acceptable level. In this way, the highest risks with the greatest severity rating and the greatest probability of occurring are managed first, and lower risks with lower probability of occurrence and lower severity rating are handled in descending order of importance.

The methodology for risks assessment could change depending on the type of the Project’s component.

Risk Management

Once the activities that may imply a risk have been identified, the H&S Manager must assure that the Project has specific plans to manage each risk; these plans must be aligned with the results of the risk assessment and the legal requirements.

The H&S Manager will assure the Identification of the respective Occupational Health and Safety legislation at each level (national, local, as well as following the best international practices).

8.11.3.2 High-Risk Activities and Work Permits

High-risk activities the ones with that are more likely to result in failure, harm or injury so, to ensure that these types of activities are carried out in a correct way it is necessary to develop a work permit process. Some examples of high-risk activities are:

- Geothermal gases;
- Working on confined spaces;
- Hot works and heat;
- Noise;
- Working at heights;
- Electrical work; and
- Lifting activities.

A work permit assures that the worker and its supervisor are aware of the risks of the activity, and will assure that all the measures to minimize the risk are applied. The work permit must contain at least:

- The name of the authorized worker;
- The type of work to be carried out and the area or place where the activity will be carried out;
- The date and time of the start of the activities, and the estimated time of completion;
- The security measures applied in accordance with the results of the risk analysis for each activity, and
- The name and signature of the employer or the person designated to grant authorization.

The work permit must be developed by the personnel carrying out the activity and reviewed by their direct supervisors, to ensure that they know the activity risks, PPE required, required emergency procedures and emergency equipment.

Safe work permits are issued for a specific work and a defined period of time for specific workers.

The H&S Manager, job supervisor and workers carrying out the activity (NREI personnel and/or contractors) must sign permits.

8.11.3.3 Personal Protective Equipment (PPE)

The Personal Protective Equipment (PPE) for each activity must be selected according to the hazards and risks identified in the risk analysis and work permit. The Project must require that PPE be provided by the employer to all Project employees depending on the type of work they are carrying out. This protective equipment must:

- Provide adequate and effective personal protection against the risks that motivate its use, without causing additional risks or unnecessary inconvenience;
- Be available to persons employed in the Project and must always be kept in conditions that allow its immediate use;
- Determine the using conditions of PPE and, in particular, when to use it, taking into account:

- The severity of the risk;
- The time or frequency of exposure to the risk;
- The conditions of the job; and
- The benefits of the team itself, taking into account its useful life and its expiration date.

Additionally,

- It will be workers' obligation to use the personal protection equipment placed at their disposal and the contractors must ensure that the workers make use of it;
- All personnel at the work site, regardless of the position, level or body to which it belongs will use the helmet of protection;
- The assembly personnel in addition to the helmet must have their safety belts, harnesses for work at heights, boots with steel tips, gloves and protective glasses;
- There will be a reserve of protective helmets to guarantee compliance with this requirement;
- The necessary measures will be taken to quickly provide first aid to any injured person during the workday;
- First aid kits will be easily accessible and clearly marked, in order to provide first aid to any worker who is injured during their work. The first aid kits must be in charge of a responsible person, trained to provide first aid.

The PPE must be selected to protect the body part exposed to the risks identified, next is a list of the most common PPE used for NREI activities:

- Head – helmet (against impact, dielectric, hood);
- Eyes and face - protective glasses, goggles, face screen, welding helmet, welding glasses;
- Ears – earplugs, earmuffs;
- Respiratory system – respirators (against particles, gases or vapors), disposable mask, autonomous respiratory equipment;
- Superior extremities – gloves (against chemical substances, dielectric, against extreme temperatures), sleeves;
- Trunk (chest, back) – apron (against extreme temperatures, against chemical substances) overall, coat, clothing against chemical substances; and
- Inferior extremities – occupational footwear, footwear against impacts, conductive footwear, dielectric footwear, spats, waterproof boots.

Other PPE used in a more specific way is:

- Protection against falls equipment; and
- Firefighting equipment.

8.11.3.4 Health and Safety Training

The H&S Manager must assure that the personnel on-site has the necessary training to carry out its activities, this includes NREI personnel, contractors and subcontractors.

Training will be based on and conducted through specific workshops and lectures to all workers. This training system will recognize that risks vary from contractor to contractor depending on the scope of work, the activities involved and the sensitive receptors and resources that may be impacted in the area of work.

Risk-based approach training is therefore essential in determining which control measures are most important for the contractor to implement and manage. The risk-based approach is utilized at three stages:

- Applicability of management plans to individual scopes of work (internal review and assessment)
- Contractor review of control measures
- Pre-commencement-work review

Workers that shall carry out activities that require a specific health and safety training will complete the training at least 10 days before the work activities start.

NREI will consider the ability of the contractor to understand and meet the requirements of the present WHSMP, the ESMP and associated plans during the qualification and selection process. As part of this process, contractors will be provided with the relevant management plans and the evaluation process will consider their ability to conform to these plans.

During contract award, NREI will conduct a commence-work review to refine, clarify, prioritize, and focus on the key legislation, standards, risks and commitments as relevant to the contractor's scope of work to ensure that they meet set standards. New control measures that are identified will be discussed and agreed for inclusion in the relevant plans.

Contractors will be required to establish OHS management arrangements in coordination with NREI to ensure conformance with management plans and other contractual commitments. These may include development of procedures and work instructions; training, definition of Key Performance Indicators (KPIs), monitoring and auditing schedules, reporting requirements, management reviews etc.

WHSMP training will include biodiversity management and risks. For further details, see Training Plan.

8.11.3.5 Personnel Health

The H&S Manager must ensure healthy conditions for its personnel, by making sure that the Project provides at least with basic necessities such as:

- Enough toilet facilities per number of workers (e.g. as a minimum two toilets for 16 to 35 employees, according to the Occupational Safety and Health Administration, OSHA);
- Toilets will be in in good conditions of preservation, hygiene and cleanliness, and will remain free of vapors. Separate toilets for men and women will also be guaranteed and not far from their workstations;
- Clean and potable water supply, on any construction site, the contractor shall guarantee sufficient sources of drinking water so that the workers can adequately replenish the liquids and avoid dehydration. These sources will be close to the workstations;
- When at least twenty-five workers work, the contractor or Project will guarantee a dining area so that the workers can eat their food comfortably and safely, with enough tables and chairs or benches. Adequate facilities will also be available to prepare food when local conditions or custom require it;
- Appropriate working hours;
- Medical Service (medical stations, first aid kits, nurse/doctor), medical stations and first aid kits will be inspected and maintained on a regular basis as some supplies may have expiration dates, in addition, each kit and/or location must be visibly marked; and
- Continuous medical check-up.

Contractors must submit to NREI a monthly report with H&S statistics and incidence of diseases in their workforce. In order to manage this information, the Project shall establish a Health Surveillance and Monitoring System.

8.11.3.6 Emergency Response

NREI has an Emergency Response Management Plan to establish preventive and response measures to respond efficiently and in a timely manner to emergencies that may take place during the execution of the Project and its components.

8.11.3.7 Traffic

Careful planning and consideration of site traffic control problems can reduce the likelihood of accidents.

Traffic on the site includes road traffic and pedestrian traffic. Road traffic contains commercial delivery vehicles (such as tankers), internal vehicles (such as trucks, cranes and excavators) and cars for employees and visitors. Pedestrian traffic includes visitors and employees on their way to or from their normal workplace at the beginning or end of the workday, or as part of their work during the day. Vehicles and pedestrians will always be separated.

Traffic routes will be determined as access routes, through the delivery site, transport routes between buildings for on-site activities or emergency access routes for fire trucks and ambulances, for example. Drivers, employees on foot and pedestrians will be able to see and understand the appropriate routes.

- When parking a vehicle, a safe parking procedure for the vehicle must be followed. Controls must be neutralized, the brakes on and the engine off to prevent movement. Vehicles will not park in the blind area of another vehicle or on slopes;
- NREI and its contractors will install mandatory and prescribed safety signs in its construction areas. The signage will follow local legislation and be in English, following the international standard for obligation, prohibition, warning and rescue signage.
- Along roads frequently crossed by animals, NREI and its contractors will install wildlife crossing signs within the Project to reduce possible vehicle accidents with wildlife.

For more details see the Traffic Management Plan.

8.11.3.8 Safety Instruction to Access the Project Sites

The following instructions will be given to all visitors and workers who access the site for the first time. Each person who receives these instructions must sign a receipt, which will be guarded by the H&S Manager:
Safety instructions for access to the work:

- It is mandatory for visitors and workers who access this workplace to comply at all times with the instructions of the H&S personnel.
- Use the adequate PPE. If you do not have them, request them to the H&S personnel.
- Pay attention when driving through the site, avoid driving through areas with obstacles or mud and stepping on sharp objects.
- Always look both ways before crossing roads, traffic lanes, or open areas. Do not approach, or interfere with, construction machinery or vehicles.
- Avoid getting close to slab edges, decking edges, etc. unless they are fully protected.
- Do not disturb or harass wildlife found on site. If sick or injured animals are found, call security and trained wildlife management authorities.

In an emergency, remain calm and follow the orders of those responsible for the work at all times. Go to the designated meeting point and remain there until the end of the emergency.

8.11.4 Health and Safety Measures

8.11.4.1 In case of managing hazardous substances

- Use appropriate personal protection equipment, namely breathing protection;
- Use adequate airing or ventilation on the maneuvering place;
- Maintain the containers properly labeled in order to facilitate first aid (in case of an emergency);
- Storage facilities with appropriate drip trays;
- Maintain the containers properly closed, in order to avoid leaks;
- Contain the spills with the available spill containment materials on site.

8.11.4.2 In case of managing geothermal gases

- Install hydrogen sulfide monitoring and warning systems. The number and location of monitors will be determined based on an assessment of plant locations prone to hydrogen sulfide emission and occupational exposure;
- Develop and communicate a contingency plan for hydrogen sulfide release events, including all necessary aspects from evacuation to resumption of normal operations;
- Provide facility emergency response teams, and workers in locations with high risk of exposure, with personal hydrogen sulfide monitors, self-contained breathing apparatus and emergency oxygen supplies, and training in their safe and effective use;
- Provide adequate ventilation of occupied buildings to avoid accumulation of hydrogen sulfide gas;
- Develop and implement a confined space entry program for areas designated as ‘Confined Spaces’;
- Providing workers with a fact sheet or other readily available information about the chemical composition of liquid and gaseous phases with an explanation of potential implications for human health and safety.

8.11.4.3 In case of exposure to heat

- Reduce the time required for work in elevated temperature environments and ensuring access to drinking water;
- Shield surfaces where workers come in close contact with hot equipment, including generating equipment, pipes etc.;
- Use of personal protective equipment (PPE) as appropriate, including insulated gloves and shoes; and
- Implement appropriate safety procedures during the drilling process.

8.11.4.4 In case of works in confined spaces

- Engineering measures will be implemented to eliminate, to the degree feasible, the existence and adverse character of confined spaces;
- Permit-required confined spaces will be provided with permanent safety measures for venting, monitoring, and rescue operations, to the extent possible;
- The area adjoining an access to a confined space will provide ample room for emergency and rescue operations;

- Access hatches will accommodate 90% of the worker population with adjustments for tools and protective clothing;
- Prior to entry into a permit-required confined space:
    1. Process or feed lines into the space will be disconnected or drained, and blanked and locked-out.
    2. Mechanical equipment in the space will be disconnected, de-energized, locked-out, and braced, as appropriate.
    3. The atmosphere within the confined space will be tested to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL).
    4. If the atmospheric conditions are not met, the confined space will be ventilated until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE.
- Safety precautions will include Self Contained Breathing Apparatus (SCBA), life lines, and safety watch workers stationed outside the confined space, with rescue and first aid equipment readily available;
- Before workers are required to enter a permit-required confined space, adequate and appropriate training in confined space hazard control, atmospheric testing, use of the necessary PPE, as well as the serviceability and integrity of the PPE will be verified. Further, adequate and appropriate rescue and / or recovery plans and equipment will be in place before the worker enters the confined space.

8.11.4.5 In case of exposure to noise

- No employee will be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear will be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C);
- The use of adequate hearing protection will be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110dB(A). Hearing protective devices (suggested PPE, ear plugs or ear muffs) provided will be capable of reducing sound levels at the ear to at least 85 dB(A);
- Although hearing protection is preferred for any period of noise exposure in excess of 85 dB(A), an equivalent level of protection can be obtained, but less easily managed, by limiting the duration of noise exposure. For every 3 dB(A) increase in sound levels, the ‘allowed’ exposure period or duration will be reduced by 50%;
- Prior to the issuance of hearing protective devices as the final control mechanism, use of acoustic insulating materials, isolation of the noise source, and other engineering controls will be investigated and implemented, where feasible;
- Periodic medical hearing checks will be performed on workers exposed to high noise levels.

8.11.4.6 In case of injuries and common accidents

- Only trained personnel will be allowed to carry out machinery activities that involve injury risks, including falls or cuts;
- It is mandatory to use the harness and the lifeline to perform work at heights, as well as the strict verification of this equipment before its use;

- The personnel carrying out works, will not be distracted, and must stay concentrated while the work is being done. It is important to remember that situations that arise from routine work are the first causes of distraction, loss of concentration and consequently incidents and accidents;
- Use rolling jacks, winches or other equipment and tools that are comfortable and easy to use to reduce material handling with your hands; place materials in easily accessible sites;
- Use correct techniques to lift weight: Lift weight by flexing your legs, not your back; strips and other protections must be used;
- To avoid the exhaustion of the personnel, they will be provided with enough liquid, take breaks in small intervals of time, especially when the weather is exhausting, either due to insolation and/ or excess humidity, or when workers are exposed to heat; use sunscreen and light colored clothing and cotton.

8.11.5 Obligations and Forbidden Actions

Specific obligations and forbidden actions are presented below, both applicable for the Project's contractors and workers.

8.11.5.1 Contractors' Obligations

- According to the labor regulations and standards, the Project, contractors, and subcontractors at all levels, are obliged to comply with all current legal provisions regarding occupational health and safety.
- Each of the contractors, and their sub-contractors, if any, is responsible for labor security and their workers' behavior inside and outside work hours, establishing sanctions for those who commit acts that attempt against the moral and good behavior of the local population. Necessary basic services such as hygienic services must be guaranteed to the workers. Likewise, contractors are responsible for the collection and disposal of generated waste.
- Vehicles, machinery and equipment maintenance in the Project must be carried out as far as possible from water sources. Likewise, waste oils, spare parts or similar items that affect the quality of the environment may not be dumped into the ground or water sources, under any circumstance.
- In order to avoid air and water pollution, the contractor must perform periodic maintenance of construction equipment and machinery.
- The contractor must give, whenever possible, employment to the local population.
- Guarantee the placement of required safety signs and symbols, as well as requesting their maintenance and replacement when necessary.
- Guarantee the acquisition and delivery of personal and collective protection equipment, as well as demanding workers to use and safeguard them.
- Ensure compliance with the necessary measures to eliminate the causes of occupational accidents and occupational diseases in coordination with union representatives and health and safety audits.
- The contractor will guarantee pre-employment medical examinations to determine the workers' aptitudes, and regular examinations depending on the activity they perform, for the early detection of occupational diseases.

8.11.5.2 Workers' Obligations

- Comply with the Project's Health and Safety instructions and regulations, as well as employing safe work methods, habits and attitudes.

- Maintain and use the personal and collective protection equipment received and return it to the person in charge once the work has been completed.
- Provide the necessary assistance in case of incidents or imminent risks in which the assets of the company or of their co-workers are endangered.
- Collaborate in the fulfillment of Project's Health and Safety Plans, Emergency Plans and Code of Conduct.
- Collaborate in inspections carried out by competent authorities in matters of Occupational Health and Safety, as well as in the Investigation of Occupational Accidents and Occupational Diseases that may occur in the company and/ or Construction Project.
- Check the Personal Protection Equipment before and after work, to verify its state. Immediately inform NREI's H&S Manager and/ or General Site Manager if equipment flaws are detected.
- Immediately report all H&S issues, accidents, risks or concerns to their supervisor, either directly or through the internal grievance mechanism.

8.11.5.3 Forbidden Actions for Workers and Contractors

- Execute acts that endanger their own safety, that of their co-workers or that of third parties, as well as that of establishments, workshops or places where they work.
- Workers are forbidden to take raw or processed materials from the site or their premises without corresponding permission and/ or authorization.
- Presenting themselves to their work while intoxicated or under the influence of toxic drugs.
- The workers will not be allowed to use the equipment that has been entrusted to them outside of the Project's work tasks. Likewise, they will not be allowed to take the equipment out of the workshop without permission.
- Smoking in restricted areas.
- Make hearths or fires to make food in inadequate places.
- Carry firearms and sharp weapons.
- Ingest alcoholic beverages or any psychotropic substance.
- Perform wildlife hunting activities or harassment of any kind to wildlife within the vicinity of the Project.
- Mobile phone usage at the construction site (outside the rest areas, such as the workers' dining area).

8.11.6 Documentation and Monitoring

The Project will maintain evidence of workers' health and safety management, which will include the attendance lists for H&S trainings, the work permits involving high-risk activities and specific certifications by personnel who carry out work activities that requires it, as well as any H&S incident that occurs at the Project.

To verify the implementation and application of this plan's management measures, the following monitoring activities will be undertaken as part of this management plan:

- Reports of accident incidents, illnesses and injuries including research and improvements shall be implemented;
- Workers' health controls shall be carried out to determine if there are disease increases that could be associated with the Project;

- Keep updated health and safety monitoring records; and
- Conduct regular evaluations with findings regarding the work sites' conditions.

8.11.7 Monitoring Systems

NREI's H&S Manager will monitor the following systems, as well as liaise with contractors' H&S Managers, on a weekly basis to conduct the monitoring activities:

- **Internal Grievance Mechanism**: all grievances will be logged in the internal grievance mechanism, including health and safety issues and concerns raised by workers. NREI's Human Resources will monitor the grievances by reviewing the internal grievance data base log which will include the measures taken to address issues, time frames, responsible personnel and any subsequent feedback that is required. NREI's Human Resources Manager in charge of monitoring the internal grievance mechanism will directly inform the H&S Manager and corresponding teams when health and safety issues are logged in. If a grievance presents a high risk, actions will be taken immediately to avoid health and safety incidents.
- **Accident and Incident Recording, Reporting and Investigation System**: this system will be used to record the number and type of accidents and incidents including near misses occurring in the workplace both at site and in offices. The details and outcomes of any required investigation, corrective actions required to address incidents, and trend analysis to detect subjects such as the recurrence of certain incidents will also be included. In addition, the roles and responsibilities for recording, reporting and investigating incidents and for corrective action planning will be monitored to make sure all the people in charge are aware of their responsibilities.
- **Health Surveillance and Monitoring System**: this system will be used to record details of similar exposure groups in the workforce including the nature of health exposures, the exposure monitoring results of monitoring campaigns and actions to be taken to address any cases of detected exceedance of workplace exposure limits, recognizing that air quality is poor in the area due to levels of particulate matter. Information, data and records relating to the health surveillance carried out on individuals including the nature and type of exposure and any related health effects shall be kept in the Human Resources Employee Database. Information obtained from exposure monitoring and surveillance campaigns will be used to tailor health awareness campaigns and training programs for the workforce.

8.11.8 Key Performance Indicators

The Workers Health and Safety Management Plan is to be reviewed on a six-month basis for the initial two years and then annually or as necessary in consultation with the H&S Manager. The Project will ensure that contractors update their plans at least once every six months during the first two years and then annually or as needed.

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-25: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Workers' Health and Safety	Number of incidents/accidents classified by type/ month and year.	Zero incidents or accidents	Construction and operations	Accident and Incident Recording, Reporting and Investigation System / Monthly

	Number of fatalities	Zero fatalities	Construction and operations	
	Number of non-fatal Injuries	Zero non-fatal injuries	Construction and operations	
	Total time lost non-fatal injuries, up to 3 days, more than 3 days	100% reported total time lost	Construction and operations	
	Number of reported incidents and accidents	100% reported, evaluated and solved incidents and accidents	Construction and operations	
	Number of personnel reported occupational diseases	100% reported occupational diseases	Construction and operations	Health Surveillance and Monitoring System / Monthly
	Number of grievances related to health and safety issues	100% grievances addressed and solved in a timely manner related to health and safety issues	Construction and operations	NREI Human Resources in coordination with contractors. Internal Grievance Mechanism database log. / Quarterly
Health and Safety Trainings	Number of personnel training courses / person / year	100% of trained personnel in a timely manner	Construction and operations	NREI Human Resources in coordination with contractors. / Yearly
Audits/ Inspections	Number of inspections/ per quarter	At least one workers' health and safety inspection per quarter	Construction and operations	NREI H&S Manager in coordination with contractors / Quarterly
	Number of findings (classified by type)/ inspections	100% reported findings corrective measures and lessons learnt.	Construction and operations	NREI H&S Manager in coordination with contractors / Quarterly

8.12 Labor Conditions and Workers Selection Plan (Exploration and Exploitation Phases)

8.12.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

NREI considers that its employees represent the true competitive advantage and the main asset of the organization. As such, NREI believes the culture and the way its employees experience the company is essential. Therefore, it will seek through different actions to promote a culture focused on excellence, by relying on its employees, their permanent development over time and access to professional opportunities and personal growth.

The Labor Conditions and Workers Selection Plan, in alignment with the Project's Human Resources Policy, aims to create the framework of action to promote mutual benefits and ensure workers are involved with the vision, mission, objectives, principles and organizational values.

8.12.1.1 Objective

The overall objectives of the Labor Conditions and Workers Selection Plan are to:

- Base the recruitment, selection and hiring of personnel on merit and competitiveness;
- Establish, maintain and improve worker-manager relationship;
- Promote fair treatment, non-discrimination and equal opportunity of workers, and compliance with healthy and safe (H&S) working conditions; and
- Protect workers' wellbeing.

8.12.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during the Project's life cycle (drilling, plant construction, commissioning and operations). It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

Contractors will use this procedure and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.12.2 Roles and Responsibilities

In order to properly implement the Labor Conditions and Workers Selection Plan, NREI requires the involvement of the people listed below.

Table 8-26: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Labor Conditions and Workers Selection Plan.

Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Labor Conditions and Workers Selection Plan.
Head of ESG	■ Be familiarized with the Labor Conditions and Workers Selection Plan.
ESG Manager	■ Update the Labor Conditions and Workers Selection Plan. ■ Review and approve the contractor project-specific Labor Conditions and Workers Selection Plan.
Calibration Committee	■ Review the evaluation of its collaborators, as established in this plan.
Human Resources Manager	■ Supervise the implementation of the Labor Conditions and Workers Selection Plan among internal stakeholders upon hiring and reinforce it as necessary. ■ Coordinate, together with the Community Relations Officer, the implementation of the temporary jobs program, according to the present plan. ■ Supervise the Performance Management Process, according to what is stated in this plan.
Community Relations Officer	■ Coordinate, together with the Human Resources Manager, the implementation of the temporary jobs program, according to the present plan.
Contractor Company	■ Develop a project-specific plan aligned with the Labor Conditions and Workers Selection Plan.
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Workers Health and Safety Management Pan.

Source: NREI, 2020

8.12.3 Activities

NREI acknowledges the importance of basic rights of workers and the value of a solid worker-manager relationship, which will be achieved through a fair treat to direct and indirect workers and the provision of health and safety (H&S) working conditions.

In order to do so, NREI has developed the Labor Conditions and Workers Selection Plan, which is composed of the steps presented herein.

8.12.3.1 Working Conditions and Management of Worker Relationship

A constructive worker-management relationship, and by treating workers fairly and providing them with safe and healthy working conditions, NREI may create tangible benefits, such as enhancement of the efficiency and productivity of its operations.

8.12.3.2 Human Resources Policy

NREI, through the Human Resources Manager, will develop, communicate, explain and make accessible to all the Project's workers an integrated Human Resources Policy upon taking employment.

The Human Resources Policy will provide workers with information regarding their rights under the applicable labor law, including their rights related to wages and benefits. It may also include NREI' vision, mission, objectives, principles and organizational values.

8.12.3.3 Working conditions and terms of employment

As part of the recruitment process, the Human Resources Manager will evaluate the candidates' skills in relation to the minimum requirements of the position to be filled. The workforce will be composed of staff with the experience, education, training and the appropriate skills required for their job functions.

To this end, the Human Resources Manager will establish job descriptions based on the essential functions of the position, as well as knowledge, skills and abilities necessary to perform the required functions.

Prior to a hiring being done, the Human Resources Manager will let the new employee know what their role will be, their contribution to the organization and how this translates into the delivery of better services. Moreover, the Human Resources Manager will make sure the new employee is aware of the exact duration of their contract, this will prevent public false accusations against the company or rumors that could affect NREI' reputation due to the termination of employment.

The Human Resources Manager will document and communicate to all new employees their working conditions and terms of employment, including wage, benefits, holidays, right to unionize in compliance with applicable local laws.

It is for the aforementioned, that NREI has established an onboarding process that considers, among others, the following elements:

- Rights and duties of the collaborators and all those regulations that govern their behavior;
- Actions that promote a work environment based on mutual respect between men and women;
- Actions aimed to prevent, tackle and eradicate any type of discrimination;
- Specific induction actions when a person joins the company, to align them with the values and responsibilities in the management of their role within the organization;
- Specific actions that allow an adequate reincorporation of those people who are integrated after a prolonged medical leave, parental post-natal leave or some other situation that for a long time has distanced them from the Project;
- Specific actions in the induction of the position when a person changes functions within the organization, assuming new responsibilities and, especially, when it comes to positions of leadership and with responsibility in the direction of the persons, in such a way, to align them with the values and responsibilities in the management of people who are responsible for it.

8.12.3.4 Worker's organizations

In countries where national law recognizes workers' rights to reunite, form and join workers' organizations and to bargain collectively, NREI will comply with national law. Note that St. Kitts and Nevis has a Trade Unions Act (02/19/1940) in place that enables freedom of association, collective bargaining and industrial relations. Nonetheless, where national law substantially restricts workers' organizations, NREI will enable alternative means for workers to express themselves and protect their rights regarding working conditions and terms of employment.

In either case described in the prior paragraph, and where national law is silent, NREI will not discourage workers from forming or joining workers' organizations or from bargaining collectively, and will not discriminate or retaliate against workers who participate, or seek to participate, in such organizations.

8.12.3.5 Non-Discrimination and Equal Opportunity

NREI will not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements, it will base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to aspects of the employment relationship, including:

- Recruitment and hiring;
- Compensation (including wages and benefits);
- Working conditions and terms of employment;
- Access to training;
- Promotion;
- Termination of employment or retirement; and
- Discipline.

In countries where national law encourages nondiscrimination in employment, NREI will comply with national law. When national laws are silent on nondiscrimination in employment, NREI will meet the conditions stated in the International Finance Corporation's (IFC) Performance Standard (PS) 2 (e.g. freedom of association, abolition of forced labor, equal remuneration).

The Human Resources Manager will ensure that the principle of equality is applied to the company's daily development of activities, by eradicating the existence of preferences or differences that may exist due to gender, religion, country of origin, sexual orientation, ethnicity, pregnancy, age, disability, among others.

8.12.3.6 Gender Equality

NREI is committed to promote gender equality and diversity though its actions. It aims to identify opportunities and strategies to improve the workplace, so both women and men can perform their jobs well, and develop action plans to institute new or strengthen existing policies and practices to recruit, retain, and promote more women.

To this regard, NREI has assumed the following compromises:

- The rates of violence against women will be part of the social studies of the region where the Project is located, so that mitigation actions can emerge if necessary;
- Possible negative impacts that NREI's actions may generate will be identified, not only in relation to human life, but also in relation to gender;
- Prioritize the cultural factors of each area, to evaluate important issues:
    - Active female voice;
    - Women's loneliness in the case of male migration to work;
    - The types of help and assistance required these women to become an active voice in employee engagement.
- A safe environment for women in the communities will be created or them to express themselves without fear of reprisal;

- All community meetings will be held at the best time for the female population of the region, always respecting their established schedules of domestic activities and attention to children and older focus groups, if necessary;
- A welcoming environment will be created for motherhood needs (e.g. take her child to a meeting);
- No woman, child, or elderly person will be put at risk or suffer any kind of reprisal;
- All of NREI's partnerships on the construction site will have contractual clauses to the detriment of:
  - Zero tolerance for moral and sexual harassment (Gender-based Violence Policy);
  - Minimum percentage of training and local female workforce in construction and project development;
  - Specific personal protection equipment for women's work;
  - Flexible working hours if women are breastfeeding.
- The Grievance Mechanisms will be able to immediately act and resolve instances and complaints of gender-related discrimination (including harassment, bullying, sexual abuse, etc.). NREI will monitor and oversee the handling of complaints of gender-related discrimination.

The Human Resources Manager will personally follow up on all workplace harassment complaints, as well as other gender related issues received through NREI's Internal or External Grievance Mechanisms.

8.12.3.7 Retrenchment

If the Project anticipates the elimination of a significant number of jobs or a layoff of a significant number of workers that cannot be avoided, the Human Resources Manager will develop and implement a plan to mitigate the adverse issues, such as:

- The schedule of cutbacks;
- Retrenchment methods and procedures;
- Selection criteria (i.e. the selection criteria for those to be laid off will be objective, fair and transparent);
- Severance payments;
- Offers of alternative employment;
- Assistance in retraining efforts and job placement.

Additionally, in many countries, national law requires advance notice to affected workers, communities and/or governments. NREI will comply with St. Kitts and Nevis national law. Where national law is silent on this matter, NREI will still notify workers and communities in advance, so they are aware if the process that will unfold.

Consultation with governmental institutions may be required by law, and, in addition, NREI will approach local governments where the scale of layoffs can have a significant effect on communities, and where government assistance may be available to help address the impacts.

NREI will also consult with employees and their organizations in developing the retrenchment plan for the Project. Consultations are essential for the development of plans to reflect workers' concerns, as well as their ideas about ways to avoid or minimize layoffs, criteria for selection and compensation payments.

The Internal and External Grievance Mechanisms adopted by NREI will both serve as communication channels to deal with claims that any provisions in the retrenchment plan were not followed.

Nonetheless, it is important to note that the Project does not expect significant retrenchments as the expected number of workers, even during peak construction periods will not exceed 75 workers. During

operations, 17 employees will work on site, and there will be five operators per shifts and a plant manager for two shifts.

8.12.3.8 Grievance Mechanism

NREI will implement an Internal Grievance Mechanism for employees and all other internal stakeholders to raise workplace related concerns (see Internal Grievance Mechanism Plan). The Human Resources Manager will inform workers of the grievance mechanism at the time of hire, as well as through refresher trainings.

8.12.4 Workforce

NREI acknowledges that the workforce is a valuable asset and a key ingredient in the sustainability of a company. Hence, it is committed to protect and prioritize its Project's workers integrity and wellbeing.

8.12.4.1 Child Labor

NREI will not employ children in any capacity. NREI will follow national applicable laws and PS.2/ILO. The St. Kitts and Nevis' Employment of Children Restriction Act prohibits full or part-time employment for children under 16 years of age. The same law protects children under the age of 14 from hazardous work situations to their health and development. The Constitution prohibits forced labor except when fulfilling a court sentence or during a period of public emergency.

8.12.4.2 Forced Labor

NREI will not recur to forced labor, which consists of any work or service not voluntarily performed that is requested from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor or similar labor-contracting arrangements.

NREI will not hold on any personal documentation of workers at any point of the Project development under any circumstances.

8.12.5 Occupational Health and Safety

NREI has designed a Workers Health and Safety Management Plan. The aim of this plan is to ensure workers perform their activities in a safe and healthy work environment, taking into account inherent risks in its particular sector and specific hazards in the Project's work areas, including physical, chemical, biological, and geothermal risks.

NREI will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of those hazards.

8.12.6 Temporary Jobs

The temporary jobs that the Project could generate for the community members during its construction and operations play a very important role for the company, as they will allow the establishment of a good relationship with local communities.

The purpose of the generation of temporary jobs, using local, not specialized people, to carry out Project's activities, is to provide a temporary source of income for the people living near the Project. The supply of jobs in the Project's Area of Influence, although short term, could affect positively in the quality of life of the neighboring people.

This process is expected to happen mainly during the construction phase of the Project and will be coordinated by the Human Resources Manager, alongside the Community Relations Officer.

8.12.6.1 Hiring Requirements

The potential beneficiaries of the program will be, on an equal footing, men and women over 18 years old, in compliance with current labor legislation.

They must be mainly inhabitants of the communities in the Project Area of Influence who are not public servers and have the necessary skills to carry out the activities.

NREI and its contractors will define clear hiring criteria, according to their internal procedures and in compliance with legal requirements, including the NREI's Human Resources Policy.

NREI will put an emphasis to attract diverse candidates, addressing bias in selection and will include gender recruitment targets to measure progress towards gender equity goals. These processes are described below.

Attracting Diverse Candidates

In order to attract diverse candidates NREI and its contractors will:

- Check job descriptions for biased terms or gendered language: Gender-inclusive terms are more likely to signal gender inclusivity and opportunities for both men and women. For example, use gender-neutral language, such as "foreperson" instead of "foreman";
- Revise job descriptions if necessary, to encourage gender diversity:
  - NREI will describe the job requirements, not the person who will fill the job. For instance, for physically demanding jobs, the specific tasks will be described, rather than describing a "physically fit" candidate.
  - Clearly state required or desirable skills; state any formal training/qualifications required (but only require them when they are necessary for the job);
  - Specifically state that the job is open to all type of candidates;
  - Highlight opportunities for career progression;
  - Clarify whether a job requires standard on-site working hours, shift-work, and/or the potential for flexible work arrangements.
- Review job announcements and recruiting material (such as print, radio advertisement, etc.) for gender-biased language:
  - Do they present a gender-diverse and inclusive image?
  - Are men and women featured?
  - Are both men and women featured in operations roles?
  - Do voice-overs in radio, social media or television feature both men and women?
- Revise job advertisements and materials to present a more gender-inclusive and diverse image:
  - Include men and women in a variety of roles;
  - Use men's and women's voices;
  - Highlight career development potential for both men and women.
- Review job applications for questions that may prompt gender bias:

- Applications will only ask for relevant information—and not request details such as marital status or age;
- Applications will include opportunities for candidates to highlight previous formal and informal work experiences that support their ability to do the job.

Review job selection criteria that may create bias. For instance, a question asking for years of experience might not directly impact skills or qualifications; however, it could put at a disadvantage male or female applicants who have taken time out of work for family reasons.

Address Bias in Selection

In order to address possible bias in the selection process, NREI and its contractors will:

- Ensure gender diversity in recruitment/selection teams: Selection teams will include at least one male and one female of equal seniority;
- Conduct bias training with HR and selection teams: This will help to identify and combat hidden biases, such as what work is appropriate for women, or how periods of absence from the workforce are judged;
- Ensure all members of selection teams are aware of relevant legislation related to non-discrimination;
- Test HR staff and selection teams for implicit bias: such as associations between women and men and different types of work;
- Develop a standardized, transparent recruitment process: This will ensure that all applicants have equal opportunity. Providing detailed criteria for all advertised positions will reduce reliance on subjective questions of “proper fit”;
- Set minimum targets for the number of shortlisted female candidates: If NREI uses a recruitment firm, NREI will make sure the firm knows about the targets and is held accountable for meeting them;
- Develop a policy on appropriate interview questions: NREI will avoid questions regarding marital status, children, intent to have children, or sexual orientation.

Recruitment Targets

Setting targets will help NREI to measure progress towards gender equity goals. They increase coordination and strengthen commitment to meeting these equity goals. While targets (and quotas) cannot address the underlying reasons for under-representation of women in particular parts of the workforce, they have been shown to be among the most effective means of addressing gaps in gender diversity.

Targets will be specific and challenging. In addition to quantitative metrics, they will include qualitative indicators of the ways in which people work together—for instance, targets that signal a more respectful workplace, more inclusive meeting practices, and more flexibility in work arrangements. Metrics also might include indicators like decreased absenteeism and turnover, and higher employee satisfaction. A table is presented below with NREI’s targets in order to achieve gender equity in employment and have a gender-inclusive work environment.

Table 8-27: Targets

Type of Target	NREI TARGET
GENDER EQUITY IN EMPLOYMENT	
REVIEW HR POLICIES AND PHYSICAL INFRASTRUCTURE	▪ Review all job descriptions and recruitment material related to positions in all departments for gender-discriminatory or discouraging language; ▪ Review HR policies regarding ergonomics, personal protective equipment (PPE), workplace safety, and equipment to ensure that these consider differences in safety needs between, men and women; ▪ Ensure that all departments on site comply with HR policies on ergonomics, PPE, workplace safety and equipment; ▪ Ensure all toilet and shower facilities to be compliant.
GENDER-INCLUSIVE WORK ENVIRONMENT	▪ Improve parity in perceptions on career development opportunities between male and female employees.

Source: ERM based on IFC, Unlocking Opportunities for Women and Business, A Toolkit of Actions and Strategies, 2020.

8.12.6.2 Communication mechanisms

Different communication mechanisms will be developed as described in the Stakeholder Engagement Plan, in order to encourage the participation of communities located within the Project Areas of Influence.

Communication activities and the publication of vacancies will contain at least the following information:

- The requirements to be a candidate for the program;
  - Applicants will have the obligation to state their personal data, including name and address, which must be corroborated by the Company's Human Resources Area;
- The jobs offered will specify temporary and/or permanent conditions;
- They will be informed if any type of minimum training related to the position offered is required.

Once the temporary employment vacancies are announced, together with their requirements, those who are in compliance may apply and, on the dates indicated, the beneficiaries of the program will be published.

8.12.6.3 Workers engaged by third parties

NREI developed the Contractors Management and Supervision Plan to define the minimum requirements that contractors and subcontractors working on behalf of NREI must meet, in order to ensure that the environmental, social, and occupational health and safety risks associated with the contracted services, products and equipment are reduced and avoided. NREI will take into account the risks inherent to their particular sector and specific classes of hazards in work areas, including physical, chemical, biological and geothermal hazards.

8.12.7 Performance Management Process

NREI has adopted a performance management process, so that each employee receives timely feedback regarding their performance, either positive to continue in their path of growth or professional development, or corrective, in order to implement corrective actions if necessary.

The process considers, among others, the following elements:

- Evaluation of cultural components, referred to the level of compliance of the competencies of each collaborator in the organization;
- Evaluation of work objectives, which involve three types:
  - Platform Success: NREI' objectives as a whole;
  - Functional Component: Group or area objectives
  - Individual Component: Specific objectives and goals for each collaborator.

To obtain final performance grade of each collaborator, the responsible evaluator must submit his/her judgment to a calibration committee, formed by NREI's management team, in which the partial result of the evaluation of its collaborators in charge will be reviewed, as to be able to count on an integral appreciation of the performance of each collaborator.

Likewise, in the calibration committee, the responsible supervisor/evaluator may have solid and consistent arguments that justify the evaluation that will be delivered. Therefore, the evaluator can also have arguments agreed by the entire committee to deliver to the employee when giving feedback.

The performance evaluation process has a duration of one year, understood as the beginning of the evaluation period, the month of January of each calendar year.

8.12.8 Documentation and Monitoring

The Human Resources Manager will be responsible for the implementation of what is stated in this plane and will keep evidence of it (e.g. documentation on NREI's policies, recruitment documents and processes, working conditions, internal grievance mechanism, workers who come from local communities, number of women hired by the Project).

8.12.9 Key Performance Indicators

The Labor Conditions and Workers Selection Management Plan is to be reviewed on a six-month basis for the initial two years and then annually or as necessary in consultation with the Human Resources Manager. The Project will ensure that contractors update their procedures at least once every six months during the first two years and then annually or as needed.

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-28: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool Frequency
Working Conditions	Human Resources Policy distributed in all the onboarding inductions	100% of Inductions shall distribute the Human Resources Policy (as well as the Code of Conduct, and other relevant policies, e.g. Sexual Harassment Policy)	Construction and operations	Human Resources Records and Internal Grievance Mechanism / Quarterly
	Sign Terms of Employment	Terms of employment explained and signed by 100% of the Project's workforce	Construction and operations	
	Non-discrimination and gender-based violence	Zero tolerance of discrimination of any type.	Construction and operations	

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool Frequency
		100% reported, evaluated and solved grievances regarding discrimination complaints and gender-based violence in a timely manner		
	Gender equality: percentage of women working in the Project	15% target	Construction and operations	
	Retrenchments	100% of informed workers regarding the schedule of cutbacks; the retrenchment procedures; transparent and fair selection criteria for those to be laid off; severance payments; and if applicable offers of alternative employment; and assistance in retraining efforts and job placement.	Construction and operations	
Workforce	Child Labor and Forced Labor	Zero child or forced labor.	Construction and operations	Human Resources Manager / Quarterly
Hiring	Recruitment Targets	100% recruitment targets met to attract diverse candidates and avoid biases during selection	Construction and operations	Human Resources Manager / Quarterly

8.13 Internal Grievance Mechanism (Exploration and Exploitation Phases)

8.13.1 Introduction

NREI (hereafter the Project) is committed to ensure the compliance of the implementation of the ESMP policies and procedures.

The Project is committed to maintaining lasting, transparent, culturally appropriate and efficient relationships with its internal and external stakeholders, through communication and engagement measures that allow receiving, analyzing and solving any concern, doubt, question regarding the environmental and social performance of the Project in all of its activities.

Based on the foregoing, the Project has developed an Internal Grievance Mechanism with the objective of identifying and managing the potential internal nonconformities and/or complaints in a timely and effective manner.

8.13.1.1 Objective

Establish an Internal Grievance Mechanism so that the Project can handle internal complaints, presented by its employees and internal stakeholders (e.g. direct workers and their organizations, workers hired by third parties, contractors, subcontractors, supply chain workers), during the development of its projects by giving them an adequate response, generating satisfactory agreements and implementing compensatory and corrective actions, when necessary.

By establishing an effective Internal Grievance Mechanism, NREI will be able to manage potential conflicts of interest by segregating the roles and responsibilities of individuals involved in the concern, suggestion or grievance management process and avoiding placing individuals in a position where conflicts could be perceived to arise.

The plan does not replace the public mechanisms of resolution of conflicts in the St. Kitts and Nevis legal system but covers the legal process in the Grievance Mechanism to minimize the management of grievances and escalation to the judicial system.

8.13.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

8.13.1.3 Definitions

The main terms used in this document are defined below:

Table 8-29: Terms and Definitions

Term	Definition

Claim	Concern, suggestion, complaint, or grievance raised by an individual or group of individuals that need to be addressed.
Claimant	Person or group pf people communicating a claim to NREI.
Concern	Requests for information or general negative perceptions unrelated to a specific Project impact or incident. If not addressed to the satisfaction of the claimant, concerns may become claims.
Conflict of interest	A conflict of interest exists where there is a divergence between the interests of an employee or contractor and his or her responsibilities or capabilities under this directive, such that an independent observer might reasonably question whether the actions of that person are influenced by his or her own interests.
Contractor	An individual or a company that has entered into a contract to provide goods or services to NREI. The term covers parties directly contracted by NREI and those contracted by a Contractor company, also referred to as subcontractors.
Grievance	A problem raised by an individual or group of individuals that needs to be addressed. Claims can result from either real or perceived impacts of NREI's operations. The terms "claim" and "grievance" can be used interchangeably.
Suggestion	Proposal, insinuation, or indication that is submitted with the aim of proposing an action to improve NREI's internal processes.
Retaliation	Any adverse action taken against a Claimant, employee, or contractor whose purpose is to frustrate the operation of this directive.
Worker Representatives	People designated from NREI or a contactor to represent Project workers. It can be a worker, supervisor, or union representative.
Workers Grievance Mechanism	A procedure through which a grievance can be raised by a worker, assessed, investigated and responded to. It is also a framework through which workers can gain access to remedy for any adverse impacts or damage they have suffered as a result of business activities.

8.13.2 Roles and Responsibilities

In order to properly implement the Internal Grievance Mechanism, NREI requires the involvement of the people listed below.

Table 8-30: Roles and Responsibilities

Role	Responsibilities
CEO	■ Review and approve the Internal Grievance Mechanism.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Internal Grievance Mechanism.
HR Manager	■ Ensure the correct implementation of the Internal Grievance Mechanism. ■ Communicate the Internal Grievance Mechanism among NREI's internal stakeholders (i.e. employees, contractors and sub-contractors)
Head of ESG	■ Ensure the correct implementation of the Internal Grievance Mechanism.
Representative of NREI's Legal Area	■ Evaluate and determine the origin of the complaints received and define the measures to be taken in response, as suitable according to what is stated in this plan.
Project Manager	■ Communicate the Internal Grievance Mechanism among NREI's internal stakeholders (i.e. employees, contractors and sub-contractors) at a project level.

Role	Responsibilities
ESG Manager	■ Help with the implementation of the Internal Grievance Mechanism. ■ Review and approve the contractor project-specific Internal Grievance Mechanism Plan. ■ Update the Internal Grievance Mechanism.
Grievance Mechanism Team	■ Manage the registration and follow up on to the feedback received. ■ Share the received feedback with the Project Manager, based on what is stated in this document. ■ Sign all responses before being communicated to the employee and/or interested parties. ■ Share the feedback of subcontractors, with the appropriate contractor when applicable
Employees, contractors and subcontractors	■ Read and be familiarized with the Internal Grievance Mechanism. ■ In case of not having a proper mechanism of their own, inform their employees working in NREI's operations about the existence of this mechanism and monitor its implementation

Source: NREI, 2020

8.13.3 Activities

The Internal Grievance Mechanism Plan establishes the guidelines for internal stakeholders to submit complaints, grievances and concerns arising from any project's activities and operations, ensuring the accessibility and effectiveness of the process.

8.13.3.1 Principles

NREI recognizes that this plan has to guarantee the same level of integrity and respect for all the people involved, as well as for any type of claim. To this regard, the Project's Internal Grievance Mechanism will be:

- **Understandable and reliable** (e.g. the affected stakeholders must understand the management plan, the confidentiality of the person filing the complaint must be protected, the expected deadline for receiving a response must be shared);
- **Culturally appropriated and accessible** (e.g. complaints can be filed in the local language, the technology required to file a complaint must be of common use, illiterate people can file complaints verbally);
- **Free of charge** (e.g. raising a complaint will not have any cost);
- **Anonymity** (e.g. the claimant will have the option to remain anonymous);
- **Proportional** (e.g. to provide the appropriate level of management to address the grievance promptly);
- **Rights-Compatible** (e.g. outcomes and remedies will be in line with internationally-recognized human rights legislation and national law. No aspect of the mechanism will prevent workers from enforcing their legal rights. Workers will be protected against retaliation for having raised complaints);
- **Inclusive and non-discriminatory** (e.g. all grievances, from all workers regardless of age, ethnicity, mental or physical disability, race, religion, gender, sexual orientation or gender identity, will be accepted, reviewed and solved as needed);

- **Transparent** (e.g. every complaint will be treated seriously, and dealt with consistently and in an impartial, confidential and transparent manner. The process is transparent and provides timely feedback to the claimant).

The present plan establishes the guidelines of the Internal Grievance Mechanism and describes how each Project along with its Grievance Mechanism Team[115] will proceed in order to adequately and satisfactorily address the possible complaints expressed by its internal stakeholders. Complaints related to affected communities and external stakeholders are covered by the External Grievance Mechanism Plan.

The Internal Grievance Mechanism aims to prevent social contingencies and conflicts with the people directly involved in the development of the Project, since it will provide, at all times, effective attention, and it has the obligation to respond to the requests of all claimants.

NREI has established a process for the reception, registration, review, analysis, resolution and evaluation of complaints, claims and concerns to be implemented in all of its projects. The process will be documented through a physical record file and will end with the closure and written agreement on the resolution of both parties (i.e. the claimant and the Project).

8.13.3.2 Publication of the Mechanism

Based on the Stakeholder Engagement Plan the Project will inform internal stakeholders about the Grievance Mechanism and the communication channels to submit complaints, claims or suggestions regarding any activities related to the Project, as well as how and where to submit them. This information will be shared through:

- Direct dialogue;
- Printed material such as brochures and posters;
- Informative presentations of the Project;
- Trainings;
- Didactic educational tools (e.g. games, videos, books, etc.).

8.13.3.3 Grievance Mechanism Procedure

In order to ensure the proper implementation of the Internal Grievance Mechanism, and the resolution of the feedback received, this mechanism is divided into four main steps. These steps are presented in the figure below.

[115] The Grievance Mechanism Team is led by the Head of HR ant the Head of ESG.

Source: ERM, 2020

Figure 8-6: Grievance Mechanism Procedure

These steps are designed based on the recommendations of the International Finance Corporation (IFC), through which a communication channel and responsible for monitoring in each of them is designated.

Reception and Registration

Once the Grievance Mechanism has been presented to the internal stakeholders, any manager of the Project, Company and/or contractors will be able to personally receive any feedback, which must then be delivered to the Grievance Mechanism Team.

In addition of the feedback collected by the managers, the feedback will be submitted through the following reception channels:

- Website – To be determined prior to the start of construction and operation activities;
- Telephone – To be determined prior to the start of construction and operation activities;
- A Grievances Mailbox placed within the Project's facilities. The mailbox's precise location will be shared with workers during their hiring process.

Any complaint or suggestion that is entered by the aforementioned means must follow the Internal GM form, attached to the present plan as **Appendix 12-A**, which shall contain the following information:

- Place and date of the complaint or suggestion;
- Reason for the feedback, with details of the events;
- Claimant's contact information (In case the grievance is not anonymous);
- Claimant's proposed solution to the issue.

The process will begin with the receipt of a complaint or suggestion by the Grievance Mechanism Team and notify the claimant that the claim has been received, will be reviewed and taken for analysis. Once the suggestions and/or complaints have been received, the Grievance Mechanism Team will complete the Communication Report (**Appendix 12-B**) and the information collected regarding the complaint and/or suggestion will be captured in the Internal GM Database (**Appendix 12-C**) to register the complaints and/or suggestions.

If the claim is readily resolvable (e.g., a request that can be immediately granted or an easy solution can be applied without an investigation process), the person receiving the claim (i.e., immediate manager, human resources or worker representative) takes action to address the issue directly and records the details in the Internal GM Database (**Appendix 12-C**). If the claim subject is considered sensitive by the claimant (e.g., in cases regarding abuse, sexual harassment, or other forms of gender-based violence), a special point of contact with adequate training will be provided. The claimant will have the option to talk to a point person of their same gender, if requested.

Claims will <u>not</u> be applicable in cases when:

1. It is not directly related to NREI, its contractors, or subcontractors;
2. It is out of NREI's influence;
3. Its nature exceeds the scope of the present Internal Grievance Mechanism;

4. The claimant has no standing to file; and/or
5. There are other formal mechanisms/institutions or community procedures more appropriate to address the issue.

When the claim is classified as **non-applicable** following the above criteria, NREI will clearly communicate the reasons why it cannot be considered to the claimant, and when possible, NREI will provide information to help them redirect their claim to the right institution or party.

The Internal Grievance Database is updated weekly to reflect the current state of the claim until the claim has been resolved according to the claimant. Reception of the claim will be acknowledged within three (3) days after the claim is received. If an investigation is needed, this will take up to 15 days (low risk claims), up to 10 days (medium risk claims) and 5 days (high risk claims).

The Project will provide a means by which all workers will be able to raise **anonymous complaints**. This gives the most vulnerable workers confidence that they will not be retaliated against for raising concerns, and can be fundamental to shifting power dynamics in the workplace. Therefore, in case of an anonymous case, the resolution will be published on a visible and accessible notice board on site and communicated in regular staff meetings.

Review, Analysis and Investigation

Once the complaints have been filed, the review, analysis and investigation process will unfold as follows:

1. The Grievance Mechanism Team will collect on a weekly basis the complaints presented, whether submitted physically or via website, and will review the nature of the complaint, as well as the company's departments potentially involved;

2. The Grievance Mechanism Team will make an initial assessment of severity in coordination with the H&S Manager, if necessary. The grievances will be classified in four categories:

   a. **Non-Admissible** (e.g. claims that are no directly related to the Project, its contractors or subcontractors, out of NREI's influence);

   b. **Low Risk** (e.g. claims that do not require resolution per se, but instead only require information or a certain clarification to be provided to the claimant. If there are recurring complaints that have been previously received and addressed by the Project, NREI will reconsider elevating the importance of the complaint, as this might be a sign that the response to the grievance has been insufficient or inadequate);

   c. **Medium Risk** (e.g. claims that require resolution and are related to minor risks associated with health, the environment, construction, transportation, and contractor and subcontractor personnel. Although important, they do not pose an immediate risk); and

   d. **High Risk** (e.g. claims related to the security and safety of Project personnel and community stakeholders, as well of those that, according to criteria of the Human Resources team, require immediate response as the claim poses an immediate major health and safety risk or a risk to an individual, to a large or small group or several groups of stakeholders. This includes claims regarding illegal and abusive activities).

3. The HR Manager will prepare the Communication Report, that includes the information listed below:

   - Internal tracking folio number provided to the claimant;

- Type of feedback,
- Area potentially involved;
- Claimant's information (In case the grievance is not anonymous);
- Date the complaint or suggestion was originated;
- Grievance Risk Category (Low, Medium or High);
- Brief description of the complaint or suggestion;
- Area responsible for monitoring and solution;
- Recommended solution;
- Term of resolution.

4. Once the complaint, claim or concern has been reviewed, the investigation must be carried out in the first instance by a member of the Grievance Mechanism Team. In case the feedback transcends and involves more areas of the Project, the suggestions and/or complaints will also be channeled to the Project Manager and the HR Manager, as appropriate, to coordinate resolution with the departments involved, depending on the scope of each, and to determine the actions to follow.

   Regardless of the categorization of the claim, the claimant must always be informed that her or his grievance has been received and is being investigated. The answer must be given in written and/or verbal form, in a clear and precise language, preferably respecting the claimant's language. In cases where the complaint is anonymous, the response will be published in the same way in which the complaint was submitted (through the website or in the module). The deadline for the resolution of a complaint or claim is according to the categories shown in the following table.

5. The evaluation of each complaint claim or concern must be in accordance with the following categories.

Table 8-31: Timeframe per Claim Category

Claim Category	Responsibilities	Response Time
Non-Admissible	Grievance Mechanism Team notifies the claimant	These suggestions and/or complaints will be communicated within fifteen (15) business days once the categorization is done.
Low Risk	The Manager of the area responsible for the resolution receives and follow up the complaint.	These suggestions and/or complaints will be addressed and answered in an average of ten (10) business days. If the complaint could not be resolved within this timeframe for reasons beyond the Project, the claimant will be notified and the time of response will be determined, considering a maximum period of three (3) months.
Medium Risk	The Manager of the area responsible for the resolution receives and attends the complaint.	The response will be carried out within an average of five (5) days after categorizing the complaint or concern, indicating that the resolution period will be of fifteen (15) business days from the complaint's registration. If the complaint could not be resolved within this timeframe for reasons beyond the Project, the applicant will be notified and the time of response will be determined, considering a maximum period of three (3) months.

Claim Category	Responsibilities	Response Time
High Risk	The Manager of the area responsible for the resolution receives and responds to the complaint immediately and communicates it to the Project Manager via email/phone call. Once registered and communicated internally, the ESG Manager will proceed to provide support for the follow-up and resolution of the complaint, collectively with the Manager of the responsible area and the Project Manager.	The response time must be immediate (within 24 hours of its submission) In the event that, for reasons beyond the Project, the complaint could not be resolute within this timeframe, the claimant will be notified, and the time of response will be determined on a case-by-case basis. However, the resolution period will not be longer than five (5) days.

Source: ERM, 2020

In high-risk situations, where there is a possibility of serious danger (e.g., death, sexual harassment), NREI will consider involving other member teams to weigh in on the resolution strategy. In these type of cases, an alternative timeline will be established for addressing and involving third parties as needed, such as police and hospitals. The Project will always protect the confidentiality of the claimant. The special procedure for High Risk Claims is described below.

1. The claim enters an expedited process for investigation and resolution by HR and if applicable other senior management, such as the H&S Manager, when appropriate.
2. NREI initiates the investigation immediately and coordinates with local authorities to appropriately address the matter for claims related to allegations of illegal or abusive acts.
3. HR meets the claimant to gather additional information as necessary. Subsequently, he or she investigates the claim (e.g., meets with members of the security team involved in the claim), develops, and implements corrective actions in collaboration with other project staff, as necessary.
4. If both the HR staff and other staff involved in the resolution of the claim are all the same gender, and the claimant prefers to speak to a person of his or her same gender, NREI will facilitate this request. This option will be disseminated when disclosing the procedure. If additional investigations are needed, these are promptly undertaken.

If the person responsible of the claim is not able to obtain a resolution within 5 days of the reception of the claim, he or she submits the claim to Human Resources, who notifies and seeks advice from the H&S Manager.

If the H&S Manager and Human Resources do not reach an agreement on a resolution within the following 5 days, Human Resources arranges meetings and discussions with relevant higher hierarchy personnel and the claimant, as well as other relevant departments, to agree on a final solution.

Before the final resolution is issued, the agreed resolution will be reviewed by the claimant, or his or her worker representative, and will confirm his or her agreement with the solution proposed.

Resolution

Once the complaints have been categorized and reviewed, the resolution and closure process will unfold as follows:

1. The first step for the resolution is the determination of the timeframe (considering the periods defined in the Table above) and its inclusion in the registration file previously elaborated.
2. The complaint or claim will be discussed by the managers of the areas involved. However, if a Manager is directly involved in the grievance, that person cannot play a role in the Internal Grievance Mechanism process in order to prevent conflicts of interest. In the case of complaints related to allegations of illegal or abusive acts, the Project will immediately initiate the investigation to adequately address the matter. Based on the investigation, the complaint may or may not proceed.
3. Depending on the risk category, the approach will be defined. The management of the responsible areas, together with a representative of the Legal Area will evaluate and determine the origin of the complaint and define the measures to be taken in response. The ESG Manager must sign all responses before they are communicated to the employee and/or interested parties.
4. If the complaint is not admissible, the claimant will be notified.
5. The Grievance Mechanism Team and the Project Manager will have performed an analysis of all the viable resolutions, seeking to, at all times, provide solutions that respond to the claimant, from a position of dialogue and respect. A complaint will be dismissed only when all the instances of solution have been exhausted, explaining in writing to the claimant, in a clear and indubitable manner, the reasons for the refusal on the resolution of the complaint.
6. All documentation issued during the process by the company to interested parties must be sent by email or written notification. In any case, the answer must have the corresponding record (the folio of complaint or suggestion) and will be properly archived as part of the process.

Right to Appeal

A worker who is not satisfied with the procedure or resolution can contest NREI's decision. The claimant will have a maximum period of fifteen (15) business days to express any disagreement with the response and appeal it. Once the deadline has elapsed and there are no new grounds for complaint, the process will be considered closed.

In the event that a claimant wishes to challenge/appeal NREI's decision or propose a counter offer, the In-Country Director and the Project Director will decide whether NREI can resolve the dispute or it is necessary to involve a third party (e.g. a mediator, technical expert, local authority, or ombudsman) to reach an agreement between the parties and resolve the dispute. The claimant will always have the right to seek other legal or administrative resources. The last resort will be the national judicial process.

When a resolution agreement is established, both parties, the Human Resources Manager, acting as the representative of NREI and the claimant, will sign it in writing. Once the solution is implemented, both parties in recognition of compliance with the agreement will sign a compliance agreement again.

Evaluation and Follow Up

It will be the responsibility of the Grievance Mechanism Team to follow up on all responses to suggestions and/or complaints in written and/or verbal form, especially those of medium and high priority, so as to confirm that the response given to the interest group was adequate, given the circumstances and criteria applicable at the time of filing the complaint. The Internal GM Database will be used to follow up each claim until is resolved and closed.

8.13.4 Confidentiality and Protection from Retaliation

The Project is committed to protecting the identity of claimants and anyone else involved in the claim, and to handling personal information in accordance with legal requirements. This duty extends to all employees and representatives of NREI and its contractors who participate in the Internal Grievance Mechanism process.

Information about a claim is shared within the company on a need-to-know basis and only to the extent necessary to complete the steps in this directive. NREI will not share personal information with third parties unless required by law or authorized by the claimant.

When a claim relates to a specific NREI or contractor employee, that person cannot play a role in the Internal Grievance Mechanism process in order to prevent conflicts of interest.

NREI does not tolerate retaliation against claimants, be they an employee or contractor. When concerns about retaliation are raised, Human Resources is responsible for leading an investigation into the alleged retaliation under NREI's Human Resources Policy and Code of Conduct.

8.13.5 Documentation and Monitoring

Once every two months, the Grievance Mechanism Team will send the Internal GM Database to the Project Manager with information on the feedback received through a consolidated report showing the status of each claim and its indicators.
This plan will be monitored continuously and is designed to facilitate the integration of lessons learned during its execution. The Project will be able to respond adequately to situations as soon as they develop.

The Internal Grievance Mechanism Plan will be reviewed annually however, if required, the mechanism could be updated as necessary. It will also ensure that contractors update their procedures at least once a year.

8.13.6 Key Performance Indicators

The table below present the key performance indicators that will evaluate the implementation of this plan:

Table 8-32: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Method/Tool / Frequency
GM attainment	NREI will review the Internal Grievance Database, including complaints closed and those unresolved. Number of grievances received per month versus number of grievances resolved.	100% of grievances resolved in a timely manner	Internal Grievance Mechanism Database and Human Resources Manager / Quarterly

Impact	Indicator	Performance Goals/ KPIs	Method/Tool / Frequency
GM time efficiency	NREI will review the Internal Grievance Database, especially the number of days between the grievances submission until its resolution and closure to calculate the average length of time needed to resolve grievances.	Low risk grievances: Max. 10 days Medium risk grievances: Max. 5 days High-risk grievances: Max. 24 hours	Internal Grievance Mechanism Database and Human Resources Manager / Quarterly
GM Focus/ Risk Areas	NREI will review the Internal Grievance Database and if necessary talk to managers of technical areas or departments, to breakdown the grievances topics (e.g. health, safety, etc.) and grievance source	Resolve 100% of grievances from all sources and about all topics. Disseminate information regarding the different solutions when there are recurrent complaints in order to decrease recurrent grievances.	Human Resources Manager in coordination with contractors / Quarterly
Method of grievance reporting	NREI will review the Internal Grievance Database and engage with workers to check the use and success of the different grievance reporting methods (e.g., number of grievances received by phone, at the office, website, and boxes).	100% of reporting methods will be functional and accessible at all times.	Human Resources Manager through direct interviews with workers / Quarterly
GM dissemination	NREI will monitor all GM informational documents, meetings, and events where the GM was disclosed and explained.	GM dissemination of information in at least 70% of events and regular meetings with staff, including contractors and subcontractors.	Human Resources Manager Records (trainings, meetings, orientation sessions, etc.) / Quarterly

8.14 Community Health and Safety Plan (Exploration and Exploitation Phases)

8.14.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

To promote its projects alignment to best international practices, NREI acknowledges that health and safety measures are an essential part of the management of any project, in order to ensure the wellbeing of the stakeholders (e.g. communities) directly and indirectly involved in its activities. Additionally, NREI recognizes that the development of its operations, as well as the equipment and infrastructure of a Project, can increase the chances of the neighboring communities of being exposed to potential risks and impacts.

NREI has adopted risk prevention as one of its main concerns and, through the Community Health and Safety Management Plan, seeks to avoid or minimize the potential risks and impacts to health and community safety that may result from activities related to any of its projects during the construction and operations phase, specially focusing on vulnerable groups.

8.14.1.1 Objective

The objective of this plan is to establish the necessary mechanisms to prevent the occurrence of incidents and accidents related to the Project that could affect neighboring communities during the different phases of the Project. More specifically, this plan intents to present the appropriate measures to respond to:

- Changes in the health of affected communities, including exposure to disease or changes in the availability and quality of water sources;
- Changes in livelihoods and income generation opportunities that affect the affected communities' access to social infrastructure;
- Changes in the security of the affected communities related to emergencies, unplanned events, crime and conflict; and
- Ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or limits risks to the community's safety and security.

8.14.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's ESMP policies and procedures, which are aligned to international best practices.

Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP will be applied on the ground. NREI will review and approve this document before any implementation.

The geographical scope is described by the Project Area of Influence (AOI), which comprises two parts:

- The physical footprint of the project, comprising the area occupied by direct components and Associated Facilities (Area of Direct Influence, ADI). Direct components are centered on the Project's

parcel, transmission line routes, substation and transportation routes to and from Charlestown. The ADI also comprises the city of Charlestown, where Project traffic and waste will have an impact.

- The ADI is considered as the area that could be directly impacted; however, the Project will also have implications for employment, the economy, planning, and service provision in the whole of the island of Nevis. Therefore, the entire island of Nevis will be considered as the Area of Indirect Influence (AII).

8.14.2 Roles and Responsibilities

In order to properly implement the Community Health and Safety Plan, NREI requires the involvement of the people listed below.

Table 8-33: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Community Health and Safety Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Community Health and Safety Plan.
Project Manager	■ Be familiarized with, review and update as necessary the Community Health and Safety Plan.
ESG Manager	■ Be familiarized and implement the Community Health and Safety Plan. ■ Review, evaluate and verify the CHS management plans. ■ Review and approve the contractor project-specific Community Health and Safety Plan. ■ Update the Community Health and Safety Plan.
H&S Manager	■ Review, evaluate and verify the CHS management plans. ■ Assure the development of an Emergency Preparedness and Response Plan for each Project ■ Present, alongside the Community Relations Officer, a monitoring report to the Project Manager.
Community Relations Officer	■ Coordinate and supervise the communication of information activities regarding this plan to the affected communities. ■ Present, alongside the H&S Manager, a monitoring report to the Project Manager.
Contractor Company	■ Develop a project-specific Stakeholder mapping Plan aligned with the Community Health and Safety Plan.

NREI's employees, contractors and subcontractors	■ Read and be familiarized with the Community Health and Safety Plan. ■ Develop a project-specific Community Health and Safety Plan.

Source: NREI, 2020

8.14.3 Activities

This plan describes the actions that need to be taken to avoid or manage potential impacts associated with Community Health and Safety (CHS) issues, which may arise from activities related to the Project. NREI will establish preventive and control measures in line with international best practices, such as the International Finance Corporation (IFC) Performance Standards.

8.14.3.1 Health and Safety Risk Identification Associated to Affected Communities

Prior to starting operations, the affected communities within the Project Area of Influence must be identified. Likewise, stakeholders will also be identified through the Stakeholder Mapping procedure (see Stakeholder Engagement Plan). At the same time, the risks associated with CHS will be determined and evaluated considering the planned and unplanned events associated with all stages of the Project. This prefeasibility assessment is the basis for defining the mitigation measures of the identified impacts and must be considered as a minimum:

- Water quality and availability;
- H_2S levels;
- Increase in local population due to the migration of the Project's workers;
- Community exposure to air, noise and water pollution;
- Design and safety of infrastructure and equipment;
- Road safety;
- Handling, storage and transport of hazardous materials and waste;
- Availability and quality of ecosystem services;
- Community exposure to communicable and non-communicable diseases, as well as vector control;
- Security personnel; and
- Emergency preparedness and response.

A specific plan will be developed to mitigate each of these impacts. The affected communities will be consulted during the aforementioned assessment process to ensure a collaborative perspective and common understanding. Likewise, stakeholder engagement activities will be conducted to inform affected communities and other external stakeholders on the potential risks identified and prevent confusion, rumors or misunderstandings. This is done through the Stakeholder Engagement Plan.

8.14.3.2 Emergency and Preparedness Response Plan

The H&S Manager must assure that, the NREI Emergency Preparedness and Response Management Plan is implemented by the Project, in all its facilities, as well as by all the contractors and subcontractors. The Emergency Preparedness and Response Plan (EPRP), considers all the possible emergency scenarios that could have an impact on the CHS of the Project's area of influence. The EPRP also considers the roles

and responsibilities for implementing the Plan, as well as the equipment, resources and skills needed to effectively apply it. All scenarios identified during the prefeasibility assessment will be tested and documented on a regular basis.

8.14.3.3 Community Health and Safety Measures

A series of Project specific plans will be developed based on the identification and environmental and social prefeasibility assessment of CHS and the EPRP (e.g. Traffic Management Plan, Noise Monitoring Plan, Traffic Management Plan), with the aim of ensuring the safety of communities within the Project Area of Influence; these plans will include the necessary controls to manage the risks. The ESG Manager along with the H&S Manager will review, evaluate and verify the development of this plan.

NREI will select and implement the physical, engineering, and administrative controls. The responsibilities of these plans must be communicated and documented.

CHS management measures will be reviewed, evaluated and verified by the H&S Manager of the Project and then presented to the ESG Manager, who will give final approval before they can be implemented.

8.14.3.4 Communication of Information

The potential Project affected communities, shall be informed in a culturally appropriated manner on the specific content of this Plan and the EPRP (emergency scenarios and its emergency response actions), as well as of the rest of NREI' ESMP procedures that directly involve them (e.g. Stakeholder Engagement Plan and the External Grievance Mechanism Plan). The CHS Plan will be communicated alongside the Stakeholder Engagement Plan; this process will be coordinated by the Community Relations Officer.

The information will include the type and nature of the risks identified, the actions proposed to avoid and manage those risks, as well as the monitoring activities planned. When evaluating the communication and consultation activity, NREI will consider within the communication its employees, contractors, affected communities, and other relevant stakeholders.

The affected communities shall have the opportunity to express their views on the identified risks, impacts, opportunities and mitigation measures of the company. NREI will consider such views and seek to respond to them appropriately.

The Community Relations Officer will gather the requests, concerns and questions of the affected communities and will ensure that they receive an adequate response in accordance with the External Grievance Mechanism Plan. Specific activities and measures are included below regarding the communication and disclosure of information about health and safety to each relevant stakeholder group.

Communication to the Affected Communities

NREI will communicate relevant health and safety information to communities that may be affected by potential emergency or health and safety situations generated at NREI facilities or due to their activities. The communication aims at making them aware on what to do in the event of an emergency and the importance of emergency preparedness and response.

NREI will distribute the Community Health and Safety Management Plan to the communities in the Project's area of influence through different channels:

- NREI's website;
- Printed copies will be made available at NREI's Community Relations Office in Charlestown;

- NREI's bi-monthly Newsletter for the communities/ radio program/ etc. (for more information about the Newsletter, see the Stakeholder Engagement Plan).

Information will be disclosed before emergency drills that involve the community take place, these will be diffused through the same channels named above. Special emphasis will be put in the difference between a drill and a real emergency. Notifications of drills will be made in a timely manner to the communities.

NREI plans to work in conjunction with industry partners, government agencies and community groups to develop programs and/or campaigns that enhance the communities' awareness of safety concerns that can be directly attributed to the Project.

NREI will also take the initiative-based approach to investing in health programs that are not necessarily targeted at mitigating impacts of the Project but will provide sustainable benefits for the Charlestown community.

Programs/initiatives may include, but are not limited to, addressing the issues of:

- Road safety;
- Community/ allied health infrastructure;
- Support for community services;
- Community health awareness and promotion; and
- Quality of life issues.

In addition, the Project will monitor the community grievance mechanism, which allows all levels of the community and stakeholders to provide feedback and/or raise concerns about the Project, including health and safety concerns. To achieve this NREI has an External Grievance Mechanism Management Plan. The Project is committed to providing adequate procedures for the community to provide feedback on the Project and will maintain a database register, which will provide information for future decision making, stakeholder engagement and reporting.

The Project will measure, audit and publicly report Health, Safety, Security and Environment (HSSE) performance and maintain open dialogue with stakeholder groups and with communities where NREI operates.

Communication to Local Authorities, Governmental Departments and External Resources

NREI will share the final Community Health and Safety Plan and the emergency plans with the local governmental organizations and external resources that have roles in emergency response scenarios and with authorities required by applicable local regulations.

NREI will communicate frequently with local emergency response resources, at least once every month during construction and once every quarter during operations, to maintain them informed about the Project's progress and collaborate in drills when necessary.

Communication to Workers, Contractors and Subcontractors

The ESG Manager ensures that the Community Health and Safety Plan, as well as the other emergency response and security plans are provided to all contractors. Employees and contractor employees are provided with the applicable plans and notified regarding their roles and responsibilities in the event of an emergency that might affect the community through training. In addition, every member of the Emergency Response Teams is trained in his or her responsibilities and NREI will ensure that they have an adequate level of competency to carry out these responsibilities in the event of an emergency.

The specific training requirements for personnel and contractors consider the following:

- Training and simulations address the requirements of authorities and any existing mutual aid agreements;
- Relevant personnel receive training after significant updates or changes to this plan;
- Refresher training is conducted at a predetermined frequency for all members of the emergency response organization (typically annually); and

Each of the emergency response position alternates also attend the full training program.

Communication to Visitors

Visitors are provided with basic safety instructions and information on evacuation routes before entering a NREI facility. If a drill is planned that day, they will be informed about it. Assembly points are clearly identified at the facility. In addition, they are accompanied at all times while at a NREI facility.

8.14.4 Training

The Project will ensure that personnel responsible for the execution of tasks and requirements in this Plan are competent on the basis of education, training, and experience. Health and safety trainings will be carried out through community focal groups at least once a quarter.

Project training activities associated with the Community Health and Safety Management Plan shall be appropriately documented by a training matrix/plan and records of training undertaken. Training will include, but not be limited to:

- COVID-19 prevention awareness;
- STI and HIV/AIDS prevention and awareness training for all employees;
- Respiratory illness and infectious disease management;
- Vector-borne disease awareness including malaria and dengue;
- Speed restrictions in populated areas, safe driving in rural areas, safe driving in dusty environments, defensive driving and basic first aid;
- Benefits of vaccinations and disease prevention;
- Wildlife Management; and
- Adverse impacts of drug and alcohol usage.

8.14.5 Documentation and Monitoring

Once every two months, the H&S Manager and the Community Relations Officer will collectively share with the Project Manager a consolidated report showing the status of the indicators presented below.

This plan will be monitored continuously and is designed to facilitate the integration of lessons learned during its execution. The Project will be able to respond adequately to situations as soon as they develop.

8.14.6 Key Performance Indicators

The Community Health and Safety Management Plan is to be reviewed on a six-month basis for the initial two years and then annually or as necessary in consultation with key stakeholders.

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-34: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Communities Health and Safety	Number of incidents/accidents or emergencies affecting the community per year	Zero incidents, accidents or emergencies	Construction and operations	Accident and Incident Recording, Reporting and Investigation System / Yearly
	Number of grievances from the community related to health and safety issues	100% grievances addressed and solved in a timely manner related to health and safety issues	Construction and operations	NREI Community Relations Officer in collaboration with the ESG Manager. External Grievance Mechanism database log. / Quarterly
Health and Safety Trainings	Number of community members trained in health and safety topics and focused groups per year	One training/ focus group with community members 15 days before construction begins. One health and safety training for community members focused on emergency scenarios and road safety near the Project, 15 days before construction begins	15 days before construction Once every six months during construction and operations	NREI Human Resources in coordination with Contractors / Yearly
	Number of NREI's workers and contractors trained in: Community Health and Safety, Code of Conduct, Fit for Work and Drug and Alcohol policies, Living in Charlestown and Emergency Trainings	100% of trained NREI workers, contractors and subcontractors	Construction and operations	NREI Human Resources Training Records / Yearly
Disclosure of Information	Number and topics of health and safety information disclosed for the communities in the Project's area of influence	At least once per quarter during construction and once per six months during operations	Construction and operations	Newsletter for the Communities / Quarterly during construction, bi-annually during operations
	Health and Safety posters and/or flyers available at NREI's Community Relations Office in Charlestown	Printed copies available at all times regarding health and safety measures for the community	Construction and operations	Community Relations Officer / Quarterly

8.15 External Grievance Mechanism (Exploration and Exploitation Phases)

8.15.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

The Project is committed to maintaining lasting, transparent, culturally appropriate and efficient relationships with its internal and external stakeholders, through communication and engagement measures that allow receiving, analyzing and solving any concern, doubt, question regarding the environmental and social performance of the Project in all of its activities. The External Grievance Mechanism is an instrument to guarantee transparency and commitment between the Project and the local population.

Based on the foregoing, the Project has developed an External Grievance Mechanism with the objective of identifying and managing the potential external nonconformities (e.g. from the affected communities) and/or complaints in a timely and effective manner.

8.15.1.1 Objective

Establish an External Grievance Mechanism so that the Project can handle external complaints, presented by stakeholders outside the Project (e.g. affected communities, external stakeholders, interested groups, etc.), during the development of its projects by giving them an adequate response, generating satisfactory agreements and implementing compensatory and corrective actions, when necessary.

By establishing an effective External Grievance Mechanism, NREI will be able to manage potential conflicts of interest by segregating the roles and responsibilities of individuals involved in the concern, suggestion or grievance management process and avoiding placing individuals in a position where conflicts could be perceived to arise. The Project recognizes that unforeseen impacts may occur, and that the maintenance of an open line of communication with the communities and/or those potentially affected by the Project is important to maintain transparent and cordial relations. In addition, international standards require the establishment of an External Grievance Mechanism in order to address the interested parties' concerns.

The procedure does not replace the public mechanisms of resolution of conflicts in the St. Kitts and Nevis legal system but covers the legal process in the Grievance Mechanism to minimize the management of grievances and escalation to the judicial system.

8.15.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that reception complaints are aligned to international best practices.

8.15.1.3 Definitions

The main terms used in this document are defined below:

Table 8-35: Terms and Definitions

Term	Definition

Claim	Concern, suggestion, complaint, or grievance raised by an individual or group of individuals that need to be addressed.
Claimant	Person or group pf people communicating a claim to NREI.
Concern	Requests for information or general negative perceptions unrelated to a specific Project impact or incident. If not addressed to the satisfaction of the claimant, concerns may become claims.
Conflict of interest	A conflict of interest exists where there is a divergence between the interests of an employee or contractor and his or her responsibilities or capabilities under this directive, such that an independent observer might reasonably question whether the actions of that person are influenced by his or her own interests.
Contractor	An individual or a company that has entered into a contract to provide goods or services to NREI. The term covers parties directly contracted by NREI and those contracted by a Contractor company, also referred to as subcontractors.
Grievance	A problem raised by an individual or group of individuals that needs to be addressed. Claims can result from either real or perceived impacts of NREI's operations. The terms "claim" and "grievance" can be used interchangeably.
Suggestion	Proposal, insinuation, or indication that is submitted with the aim of proposing an action to improve NREI's internal processes.
Retaliation	Any adverse action taken against a Claimant, employee, or contractor whose purpose is to frustrate the operation of this directive.
External Grievance Mechanism	A procedure through which a grievance can be raised by a member of the community, assessed, investigated and responded to. It is also a framework through which workers can gain access to remedy for any adverse impacts or damage they have suffered as a result of business activities.

8.15.2 Roles and Responsibilities

In order to properly implement the External Grievance Mechanism, NREI requires the involvement of the people listed below.

Table 8-36: Roles and Responsibilities

Role	Responsibilities
CEO	■ Review and approve the External Grievance Mechanism.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the External Grievance Mechanism.
Head of ESG	■ Ensure the correct implementation of the External Grievance Mechanism.
Representative of NREI's Legal Area	■ Evaluate and determine the origin of the complaints received and define the measures to be taken in response, as suitable according to what is stated in this plan.
Project Manager	■ Be familiarized with the External Grievance Mechanism and provide the necessary resources to ensure its proper implementation.
ESG Manager	■ Ensure the correct implementation of the External Grievance Mechanism. ■ Review and approve the contractor project-specific External Grievance Mechanism. ■ Update the External Grievance Mechanism.

Role	Responsibilities
Grievance Mechanism Team	■ Be familiarized and disseminate the External Grievance Mechanism among external stakeholders. ■ Prepare the Communication Report, and follow up on the feedback received. ■ Share the External Grievance Mechanism Database with the Project Manager. ■ Share the received feedback with the Project Manager.
Community Relations Officer	■ Collect on a weekly basis the complaints presented, whether submitted physically or via website. ■ Review the nature of the complaint, as well as the company's departments potentially involved. ■ Solve, as immediate as possible the feedback received, if there are conditions to do so. ■ Keep a record of the solutions that were given for documentation, monitoring or verification of the solution applied.
Employees, contractors and subcontractors	■ Read and be familiarized with the External Grievance Mechanism.

Source: NREI, 2020

8.15.3 Activities

The External Grievance Mechanism Plan establishes the guidelines for external stakeholders to submit complaints, grievances and concerns arising from any project's activities and operations, ensuring the accessibility and effectiveness of the process.

8.15.3.1 Principles

NREI recognizes that this plan has to guarantee the same level of integrity and respect for all the people involved, as well as for any type of claim. To this regard, the Project's External Grievance Mechanism will be:

- **Understandable and reliable** (e.g. the affected stakeholders must understand the procedure, the confidentiality of the person filing the complaint must be protected, the expected deadline for receiving a response must be shared);
- **Culturally appropriated and accessible** (e.g. complaints can be filed in the local language, the technology required to file a complaint must be of common use, illiterate people can file complaints verbally);
- **Free of charge** (e.g. raising a complaint will not have any cost);
- **Anonymity** (e.g. the claimant will have the option to remain anonymous);
- **Proportional** (e.g. to provide the appropriate level of management to address the grievance promptly);
- **Rights-Compatible** (e.g. outcomes and remedies will be in line with internationally recognized human rights legislation and national law. No aspect of the mechanism will prevent community members from enforcing their legal rights. Community members will be protected against retaliation for having raised complaints);
- **Inclusive and non-discriminatory** (e.g. all grievances, from all community members regardless of age, ethnicity, mental or physical disability, race, religion, gender, sexual orientation or gender identity, will be accepted, reviewed and solved as needed);

- **Transparent** (e.g. every complaint will be treated seriously, and dealt with consistently and in an impartial, confidential and transparent manner. The process is transparent and provides timely feedback to the claimant).

The present plan establishes the guidelines of the External Grievance Mechanism and describes how the Project along with its Community Relations Team will proceed in order to adequately and satisfactorily address the possible complaints expressed by the community or other external stakeholders. Complaints related to internal stakeholders (e.g. workers, contractors, subcontractors, etc.) are covered on the Internal Grievance Mechanism Management Plan.

The External Grievance Mechanism aims to prevent social contingencies and conflicts with the people that might be affected by the development of the Project, since it will provide, at all times, effective attention, and it has the obligation to respond to the requests of all claimants.

NREI has established a process for the reception, registration, review, analysis, resolution and evaluation of complaints, claims and concerns to be implemented in all of its projects. The process will be documented through a physical record file and will end with the closure and written agreement on the resolution of both parties (i.e. the claimant and the Project).

8.15.3.2 Publication of the Mechanism

Based on the Stakeholder Engagement Plan, the HR Manager and the Project Manager will inform the affected communities and other external stakeholders about the Grievance Mechanism and the communication channels to submit complaints, claims or suggestions regarding any activities related to the Project, as well as how and where to submit them. This information will be shared through:

- Direct dialogue;
- Distribution of printed material such as brochures and posters, which will be proposed by the ESG team and reviewed by the Marketing and Communication management of NREI;
- Available information at the Project's Community Relations Office;
- Press and media;
- Didactic educational tools (e.g. games, videos, books, etc.).

8.15.3.3 Grievance Mechanism Procedure

In order to ensure the proper implementation of the External Grievance Mechanism, and the resolution of the feedback received, this mechanism is divided into four main steps. These steps are presented in the figure below.

Source: ERM, 2020

Figure 8-7: Grievance Mechanism Procedure

These steps are designed based on the recommendations of the International Finance Corporation (IFC), through which a communication channel and responsible for monitoring in each of them is designated.

Reception and Registration

The Community Relations Team will manage the External Grievance Mechanism. The external claimants will be able to submit their grievances through the following reception channels:

- Website – To be determined prior to the start of construction and operation activities;
- Telephone – To be determined prior to the start of construction and operation activities;
- A Grievances Mailbox placed at the Project's Community Relations Office. The mailbox's precise location will be shared with the community during public consultation and other disclosure of information events.

Any complaint or suggestion that is entered by the aforementioned means must follow the External GM form, attached to the present procedure as **Appendix 14-A**, which shall contain the following information:

- Place and date of the complaint or suggestion;
- Reason for the feedback, with details of the events;
- Claimant's contact information (In case the grievance is not anonymous);
- Claimant's proposed solution to the issue.

The process will begin with the receipt of a complaint or suggestion by the Community Relations Team and notify the claimant that the claim has been received, will be reviewed and taken for analysis. Once the suggestions and/or complaints have been received, the Community Relations Team will complete the Communication Report (**Appendix 14-B**) and the information collected regarding the complaint and/or suggestion will be captured in the External GM Database (**Appendix 14-C**) to register the complaints and/or suggestions.

If the claim is readily resolvable (e.g., a request that can be immediately granted or an easy solution can be applied without an investigation process), the person from the Community Relations Team receiving the claim takes action to address the issue directly and records the details in the External GM Database

(**Appendix 14-C**). If the claim subject is considered sensitive by the claimant (e.g., in cases regarding abuse, sexual harassment, or other forms of gender-based violence), a special point of contact with adequate training will be provided. The claimant will have the option to talk to a point person of their same gender, if requested.

Claims will not be applicable in cases when:

1. It is not directly related to NREI, its contractors, or subcontractors;
2. It is out of NREI's influence;
3. Its nature exceeds the scope of the present External Grievance Mechanism;
4. The claimant has no standing to file; and/or
5. There are other formal mechanisms/institutions or community procedures more appropriate to address the issue.

When the claim is classified as **non-applicable** following the above criteria, NREI will clearly communicate the reasons why it cannot be considered to the claimant, and when possible, NREI will provide information to help them redirect their claim to the right institution or party.

The External Grievance Database is updated weekly to reflect the current state of the claim until the claim has been resolved according to the claimant. Reception of the claim will be acknowledged within three (3) days after the claim is received. If an investigation is needed, this will take up to 30 days (low risk claims), up to 15 days (medium risk claims) and 5 days (high risk claims).

The Project will provide a means by which all external stakeholders will be able to raise **anonymous complaints**. This gives the most vulnerable members of the affected communities, the confidence that they will not be retaliated against for raising concerns, and can be fundamental to shifting power dynamics in between the Project and the communities. Therefore, in case of an anonymous case, the resolution will be published on a visible and accessible notice board at the Community Relations Office.

Review, Analysis and Investigation

Once the complaints have been filed, the review, analysis and investigation process will unfold as follows:

1. The Community Relations Team will collect on a weekly basis the complaints presented, whether submitted physically or via website, and will review the nature of the complaint, as well as the company's departments potentially involved;

2. The Community Relations Team will make an initial assessment of severity in coordination with the H&S Manager, if necessary. The grievances will be classified in four categories:

a. **Non-Admissible** (e.g. claims that are no directly related to the Project, its contractors or subcontractors, out of NREI's influence);

b. **Low Risk** (e.g. claims that do not require resolution per se, but instead only require information or a certain clarification to be provided to the claimant. If there are recurring complaints that have been previously received and addressed by the Project, NREI will reconsider elevating the importance of the complaint, as this might be a sign that the response to the grievance has been insufficient or inadequate);

c. **Medium Risk** (e.g. claims that require resolution and are related to minor risks associated with health, the environment, construction, transportation, and external stakeholders. Although important, they do not pose an immediate risk); and

d. **High Risk** (e.g. claims related to the security and safety of the community stakeholders, as well of those that, according to criteria of the Community Relations team, require immediate response as the claim poses an immediate major health and safety risk or a risk to an individual, to a large or small group or several groups of stakeholders. This includes claims regarding illegal and abusive activities).

3. The Community Relations Team will prepare the Communication Report that includes the information listed below:

- Internal tracking folio number provided to the claimant;
- Type of feedback,
- Area potentially involved;
- Claimant's information (In case the grievance is not anonymous);
- Date the complaint or suggestion was originated;
- Grievance Risk Category (Low, Medium or High);
- Brief description of the complaint or suggestion;
- Area responsible for monitoring and solution;
- Recommended solution;
- Term of resolution.

Once the claim has been reviewed, the investigation must be carried out in the first instance by a member of the Community Relations Team. In case the feedback transcends and involves more areas of the Project, the suggestions and/or complaints will also be channeled to the Project Manager and the HR Manager, as appropriate, to coordinate resolution with the departments involved, depending on the scope of each, and to determine the actions to follow.

Regardless of the categorization of the claim, the claimant must always be informed that her or his grievance has been received and it is being investigated. The answer must be given in written and/or verbal form, in a clear and precise language, preferably respecting the claimant's language. In cases where the complaint is anonymous, the response will be published at the Project's Community Relations Office. The deadline for the resolution of a complaint or claim is according to the categories is presented below.

5. The evaluation of each complaint claim or concern must be in accordance with the following categories.

Table 8-37 Timeframe per Claim Category

Claim Category	Responsibilities	Response Time
Non-Admissible	Community Relations Team notifies the claimant	These suggestions and/or complaints will be communicated within thirty (30) business days once the categorization is done.

Low Risk	The Manager of the area responsible for the resolution receives and follow up the complaint.	These suggestions and/or complaints will be addressed and answered in an average of thirty (30) business days. If the claim cannot be resolved within this timeframe for reasons beyond the Project, the claimant will be notified and the time of response will be determined, considering a maximum period of three (3) months.
Medium Risk	The Manager of the area responsible for the resolution receives and attends the complaint.	The response will be carried out within an average of five (5) days after categorizing the complaint or concern, indicating that the resolution period will be of fifteen (15) business days from the complaint's registration. If the complaint could not be resolved within this timeframe for reasons beyond the Project, the applicant will be notified and the time of response will be determined, considering a maximum period of three (3) months.
High Risk	The Manager of the area responsible for the resolution receives and responds to the complaint immediately and communicates it to the Project Manager via email/phone call. Once registered and communicated internally, the ESG Manager will proceed to provide support for the follow-up and resolution of the complaint, collectively with the Manager of the responsible area and the Project Manager.	The response time must be immediate (within 24 hours of its submission) In the event that, for reasons beyond the Project, the complaint could not be resolute within this timeframe, the claimant will be notified, and the time of response will be determined on a case-by-case basis. However, the resolution period will not be longer than five (5) days.

Source: ERM, 2020

In high-risk situations, where there is a possibility of serious danger (e.g., death, sexual harassment), NREI will consider involving other member teams to weigh in on the resolution strategy. In these type of cases, an alternative timeline will be established for addressing and involving third parties as needed, such as police and hospitals. The Project will always protect the confidentiality of the claimant. The special procedure for High Risk Claims is described below.

6. The claim enters an expedited process for investigation and resolution by the Community Relations Team and if applicable other senior management, such as the H&S Manager, when appropriate.
7. NREI initiates the investigation immediately and coordinates with local authorities to appropriately address the matter for claims related to allegations of illegal or abusive acts.
8. The Community Relations Team meets the claimant to gather additional information as necessary. Subsequently, he or she investigates the claim (e.g., meets with members of the

security team involved in the claim), develops, and implements corrective actions in collaboration with other project staff, as necessary.

9. If both the Community Relations Team staff and other staff involved in the resolution of the claim are all the same gender, and the claimant prefers to speak to a person of his or her same gender, NREI will facilitate this request. This option will be disseminated when disclosing the procedure. If additional investigations are needed, these are promptly undertaken.

If the person responsible of the claim is not able to obtain a resolution within 5 days of the reception of the claim, he or she submits the claim to Community Relations Team, who notifies and seeks advice from the H&S Manager.

If the H&S Manager and Community Relations Team do not reach an agreement on a resolution within the following 5 days, Community Relations Team arranges meetings and discussions with the In–Country Director or relevant higher hierarchy personnel and the claimant, as well as other relevant departments, to agree on a final solution.

Before the final resolution is issued, the agreed resolution will be reviewed by the claimant, or his or her worker representative, and will confirm his or her agreement with the solution proposed.

Resolution

Once the complaints have been categorized and reviewed, the resolution and closure process will unfold as follows:

1. The first step for the resolution is the determination of the timeframe (considering the periods defined in the Table above) and its inclusion in the registration file previously elaborated.
2. The claim will be discussed by the Community Relations Team, and if necessary, the managers of the areas involved. In the case of complaints related to allegations of illegal or abusive acts, the Project will immediately initiate the investigation to adequately address the matter. Based on the investigation, the complaint may or may not proceed.
3. Depending on the risk category, the approach will be defined. The Community Relations Team, together with a representative of the Legal Area will evaluate and determine the origin of the complaint and define the measures to be taken in response. All responses must be signed by the ESG Manager before being communicated to the employee and/or interested parties.
4. If the complaint is not admissible, the claimant will be notified.
5. The Community Relations Team and the Project Manager will have performed an analysis of all the viable resolutions, seeking to, at all times, provide solutions that respond to the claimant, from a position of dialogue and respect. A complaint will be dismissed only when all the instances of solution have been exhausted, explaining in writing to the claimant, in a clear and indubitable manner, the reasons for the refusal on the resolution of the complaint.
6. All documentation issued during the process by the company to interested parties must be sent by email or written notification. In any case, the answer must have the corresponding record (the folio of complaint or suggestion) and will be properly archived as part of the process.

Right to Appeal

If an external stakeholder who is not satisfied with the procedure or resolution, she or he can contest NREI's decision. The claimant will have a maximum period of fifteen (15) business days to express any

disagreement with the response and appeal it. Once the deadline has elapsed and there are no new grounds for complaint, the process will be considered closed.

In the event that a claimant wishes to challenge/appeal NREI's decision or propose a counter offer, the In-Country Director and the Project Director will decide whether NREI can resolve the dispute or it is necessary to involve a third party (e.g. a mediator, technical expert, local authority, or ombudsman) to reach an agreement between the parties and resolve the dispute. The claimant will always have the right to seek other legal or administrative resources. The last resort will be the national judicial process.

When a resolution agreement is established, both parties, the Head of HR acting as the representative of NREI and the claimant, will sign it in writing. Once the solution is implemented, both parties in recognition of compliance with the agreement will sign a compliance agreement again.

Evaluation and Follow Up

It will be the responsibility of the Community Relations Team to follow up on all responses to suggestions and/or complaints in written and/or verbal form, especially those of medium and high priority, so as to confirm that the response given to the interest group was adequate, given the circumstances and criteria applicable at the time of filing the complaint. The External GM Database will be used to follow up each claim until is resolved and closed.

8.15.4 Confidentiality and Protection from Retaliation

The Project is committed to protecting the identity of claimants and anyone else involved in the claim, and to handling personal information in accordance with legal requirements. This duty extends to all employees and representatives of NREI, its contractors and community members who participate in the External Grievance Mechanism process.

Information about a claim is shared within the company on a need-to-know basis and only to the extent necessary to complete the steps in this directive. NREI will not share personal information with third parties unless required by law or authorized by the claimant.

When a claim relates to a specific NREI or contractor employee, that person cannot play a role in the External Grievance Mechanism process in order to prevent conflicts of interest.

NREI does not tolerate retaliation against claimants, be they an employee, contractor or external stakeholder. When concerns about retaliation are raised, Human Resources/ Community Relations Team is responsible for leading an investigation into the alleged retaliation under NREI's Human Resources Policy and Code of Conduct.

8.15.5 Documentation and Monitoring

Once every two months, the Community Relations Team will send the External GM Database to the Project Manager with information on the feedback received through a consolidated report showing the status of each claim and its indicators.

This plan will be monitored continuously and is designed to facilitate the integration of lessons learned during its execution. The Project will be able to respond adequately to situations as soon as they develop.

The External Grievance Mechanism Plan will be reviewed annually, however, if required, the mechanism could be updated as necessary. It will also ensure that contractors update their procedures at least once a year.

8.15.6 Key Performance Indicators

The table below present the key performance indicators that will evaluate the implementation of this plan:

Table 8-38: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Method/Tool/ Frequency
GM attainment	NREI will review the External Grievance Database, including complaints closed and those unresolved. Number of grievances received per month versus number of grievances resolved.	100% of grievances resolved in a timely manner	External Grievance Mechanism Database and Community Relations Team / Quarterly
GM time efficiency	NREI will review the External Grievance Database, especially the number of days between the grievances submission until its resolution and closure to calculate the average length of time needed to resolve grievances.	Low risk grievances: Max. 30 days Medium risk grievances: Max. 15 days High-risk grievances: Max. 5 days	External Grievance Mechanism Database and Community Relations Team / Quarterly
GM Focus/ Risk Areas	NREI will review the External Grievance Database and if necessary talk to the Community Relations Team to breakdown the grievances topics (e.g. health, safety, etc.) and grievance source	Resolve 100% of grievances from all sources and about all topics. Disseminate information regarding the different solutions when there are recurrent complaints in order to decrease recurrent grievances.	External Grievance Mechanism Database and Community Relations Team / Quarterly
Method of grievance reporting	NREI will review the External Grievance Database and engage with community members to check the use and success of the different grievance reporting methods (e.g., number of grievances received by phone, at the office, website, and boxes).	100% of reporting methods will be functional and accessible at all times.	Community Relations Team / Quarterly
GM dissemination	NREI will monitor all GM informational documents, meetings, and events where the GM was disclosed and explained to the affected communities.	GM dissemination of information in at least 70% of disclosure of information events, consultations and other activities.	Community Relations Team Records / Quarterly

8.16 Contractor Management Plan (Exploration and Exploitation Phases)

8.16.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

NREI needs to implement technical and organizational measures to ensure all the conducted work by Contractors and Subcontractors is managed in a correct manner, in conformity with local, state and internal requirements.

8.16.1.1 Objective

The objective of this plan is to define the minimum requirements for contractors and subcontractors working on behalf of NREI to minimize health, safety, environmental, and social (HSES) risks associated with the contracted services.

The Contractor Management and Supervision Plan is a management tool that will be updated periodically to ensure the efficiency of contractor management.

8.16.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's Environmental and Social Management Plans (ESMP) policies and procedures, which are aligned with international best practices.

Contractors will use this procedure and develop it further to provide specifics on how the various requirements from the Project-specific Environmental and Social Management Plans (ESMP) will be applied on the ground. NREI will review and approve this document before any implementation.

8.16.2 Roles and Responsibilities

In order to properly implement the Contractor Management and Supervision Plan, NREI requires the involvement of the people listed below.

Table 8-39: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Contractor Management and Supervision Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Contractor Management and Supervision Plan.
Head of ESG	■ Assure the correct implementation of the Contractor Management and Supervision Plan
ESG Manager	■ Assure the correct implementation of the Contractor Management and Supervision Plan ■ Update the Contractor Management and Supervision Plan. ■ Review and approve the contractor project-specific contractors' supervision plan.
Project Manager	■ Implement the Contractor Management and Supervision Plan.
H&S Manager	■ Implement the Contractor Management and Supervision Plan.

Role	Responsibilities
	■ Ensure the generation of evidence and reports for compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Contractor Management and Supervision Plan.
Environmental Coordinator	■ Help with the implementation of the Contractor Management and Supervision Plan
Community Relations Officer	■ Help with the implementation of the Contractor Management and Supervision Plan
Labor Officer	■ Help with the implementation of the Contractor Management and Supervision Plan
Contractor Company	■ Develop a project-specific Contractors Supervision Plan aligned with NREI's Contractors Management Plan
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Contractor Management and Supervision Plan

Source: NREI, 2020

8.16.3 Activities

The following sections explain the activities and requirements for the proper management of contractors and subcontractors.

8.16.3.1 Contractor Management Procedure

NREI does not perform engineering and construction work in-house. Instead, the company contracts out engineering, procurement and construction work to one or more contractors. Contractor management plays a key role in NREI's business. As of the date of this management plan, NREI has selected Schlumberger as the drilling contractor. NREI is evaluating other contractors for other aspects of the Project.

NREI selects and approves its contractors, as well as product suppliers, through a pre-qualification process. Pre-qualification ensures that NREI only works with suppliers of goods and services that are able to comply with NREI's policies.

Contractor management can be achieved through six steps:

1. Definition of the scope of work
2. Pre-qualification of the contractor
3. Contractor selection
4. Contract award and terms establishment
5. Contractor monitoring
6. Post contract review

Collaboration between Head of EPC, ESG Manager and Project Manager is essential for the efficient implementation of these steps.

Definition of the scope of work

Once the project is defined, the Project Manager reviews the project description and prepares the ESHS-related requirements to be included in the tender specifications. These requirements will address ESHS needs and red flags identified during the Project design process. As appropriate, this will also reflect requirements found in project-related and authorizations (e.g., licenses and permits).

Special design requirements to avoid or mitigate potential impacts must also be included in the ESHS requirements to be disclosed to the contractors in the tender specifications.

If the bidders have any questions before submitting the proposal, the NREI management may meet with the bidder to provide guidance on how to comply with ESHS requirements. When considered appropriate, the bidders are given the opportunity to address gaps identified in their proposals. The Project Manager evaluates the proposals once they are received. The objective is to determine if the proposal adequately addresses ESHS requirements. Proposals that do not adequately address these requirements will be either rejected, or returned to the bidder for improvements.

Definition of the scope of work

Once the project is defined, NREI Management and Project Manager reviews the project description and prepares the ESHS-related requirements to be included in the tender specifications. These requirements will address ESHS needs and red flags identified during the Project design process. As appropriate, this will also reflect requirements found in project-related and authorizations (e.g., licenses and permits).

Special design requirements to avoid or mitigate potential impacts must also be included in the ESHS requirements to be disclosed to the contractors in the tender specifications.

If the bidders have any questions before submitting the proposal, the Project Manager may meet with the bidder to provide guidance on how to comply with ESHS requirements. When considered appropriate, the bidders are given the opportunity to address gaps identified in their proposals. The Project Manager evaluates the proposals once they are received. The objective is to determine if the proposal adequately addresses ESHS requirements. Proposals that do not adequately address these requirements will be either rejected, or returned to the bidder for improvements.

Pre-qualification of the contractor

It is important to assure ESHS compliance throughout the contracting process, to ensure that, contractors are aligned with NREI's policies. The contractor's capacity will be evaluated and a short list of candidates will be developed. This ensures that only competent contractors are pre-qualified and allow more time to evaluate the performance of bidders. Pre-qualifying means that only approved and competent contractors are invited to tender for a Project's activity or work.

NREI pre-qualifies contractors and suppliers by requesting specific information as part of the Solicitation of Interest. The specific information requested depends on the type of goods or services being procured, but will generally include some or all of the following:

- References from previous customers.
- Previous ESHS performance data, including past record of environmental accidents and history of ESHS claims, violations, and fines.
- Safety statistics, such as:

  - Employee hours worked during the last three years, separating office personnel and site workers; and
  - Total injuries and illnesses, specifying fatalities, Lost Time Injuries (LTI), and Work Related Illnesses.

- ESHS training programs.
- Qualifications of ESHS personnel.
- Expected ESHS impacts and risks (for the activities and services to be contracted).
- Commitment to work under NREI's ESMP or description of the management systems in place to manage ESHS issues, including:
  - Management leadership and commitment;
  - ESHS policies, codes of conduct, worker conditions, objectives, and targets;
  - Organization, resources, and documentation;
  - Assessment and management of risks and impacts;
  - Identification and compliance with applicable regulations;
  - Other planning and procedures;
  - Management programs describing environmental controls and health and safety practices;
  - Emergency preparedness and response;
  - Grievance mechanisms;
  - ESHS Implementation Monitoring; and
  - Auditing and Review.
- Audit reports.
- Supply chain and subcontractor management criteria. These will include contractual requirements for ensuring: compliance with the supplier's or contractor's ESHS policies; prohibition of the use of child and forced labor; and robust monitoring and auditing practices.
- Evidence of third-party certification or accreditation.
- Evidence of insurance coverage for risk jobs and for risks associated with the environment.

The information sent back by the contractor or supplier is evaluated ESG Manager and the Project Manager, both have the authority to evaluate and approve, or reject, contractors or suppliers based on the responses and information provided.

The ESG Manager together with the Head of EPC will maintain an updated database of contractors, which will include their prequalification or pre-evaluation. Both will ensure that only prequalified or pre-evaluated contractors are taken into account.

Contractor Selection

Contractor selection will be influenced by many factors such as the information provided for pre-qualification (past experience, safety statistics, resources, etc.), their technical proposal, and pricing.
As part of the selection process, each bidder must complete and submit a draft ESHS Plan aligned with the NREI's Workers Health & Safety Management Plan.

The ESG Manager together with the Project Manager will review the bidder profiles and all information submitted to ensure they collect the necessary evidence to comply with NREI's corporate standards.

Contractor Award

Once the contractor or supplier has been selected, a contract is drafted. At this point, the Project Manager with help of NREI's Legal Department includes the necessary clauses in the contract to allow NREI to enforce compliance with the company's ESHS requirements.

Per the contract with NREI, the principal Contractor must align with the Project's ESHS standards and procedures, including communication methods, responsibility and contract monitoring.

Contractors responsibility

If not already in place, the Contractor will stablish policies and procedures to manage and supervise its own subcontractors.

The responsibilities of the Contractors include, but are not limited to:

- Responsible for complying with all applicable host country ESHS regulations and permit or licenses commitments;
- Work safely to ensure the safety of their own employees, as well as that of other contractors, site visitors, the general public and the environment;
- Ensure that employees are properly trained, certified, qualified or competent for the activities they are expected to perform;
- Conduct or participate in the required meetings of Health, Safety and Environment;
- Provide and ensure that workers use all the required Personal Protection Equipment (PPE);
- Resolve any applicable corrective action that results from agency or NREI inspections, promptly and to NREI's satisfaction;
- Report all incidents to the Project Manager.
- Conduct environmental monitoring for all relevant phases of work and report emerging risks to NREI management.

Each Contractor is responsible for their employee's and subcontractor activities. Therefore, if the Contractor intends to subcontract part of the service, the third party must meet all the requirements described in this plan for the duration of the contract. The Contractor will be responsible for conducting supervision and enforcing NREI's standards.

Review and approval of contractor ESHS documents

Contractors and subcontractors are required to send all of the ESHS plans and procedures that intend to utilize during the Project to the Project Manager, prior to the initiation of any activities controlled by these documents. NREI Management and the Project Manager, review the documents to ensure that contractors and subcontractors comply with NREI policies, and management plans, as well as with host country ESHS laws and regulation. The activities controlled by these documents cannot be initiated until the documents are approved by NREI Management and the Project Manager. The ESHS documents must be available for NREI review at the Contractor office and on-site whenever possible.

In the event that a contractor has ESHS documents that cover the same topics as NREI corporate and/or Project documents, NREI Management will determine which documents will apply to the contractor's work for the Project. Then, the documents that apply will be listed in a Bridging Document.

Contractor documents must clearly describe the objective, process, responsibilities, and relation to other elements of the ESHS documents. Specifically, management plans will include the following information:

1. Objectives;
2. Legal requirements;
3. Roles and responsibilities;
4. Training;
5. Process description;
6. Monitoring;
7. Performance indicators; and
8. Reporting and notification requirements.

8.16.4 Training and Competency

Prior to the start of any activity, contractors must ensure and provide evidence that their workers have received the necessary information and training to recognize the present work risks to protect their health, and to have the necessary skills to do the assigned activities.

Before starting the assigned work, employees must have, at least the following information:

- Knowledge of materials, equipment and tools;
- Identified risks associated to operations and the control measures;
- Potential risks for health and safety along with prevention measures;
- Health and safety norms that can be applied;
- PPE use;
- Emergency procedure;
- Incidents or accidents reporting method;
- Insurance for risks and environmental associated risks;
- Waste disposal standards;
- Environmental protection norms;
- Understanding of the grievance's mechanism;
- Existence of Human Resources Procedure or mechanism to make sure that work conditions are in agreement with national regulation; and
- Labor law elements.

8.16.5 Contractor Supervision Procedure

NREI has established an impartial evaluation of the contractors and subcontractors' environmental, social, health and safety occupational performance, during the Project's lifecycle. The result of this evaluation may be considered for future contracting processes to ensure the provision of quality services and strong commitment in the environmental, social, health and safety occupational dimensions.
Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific Environmental and Social Management Plans (ESMP) will be applied on the ground. NREI will review and approve this document before any implementation.

8.16.5.1 Direct Supervision

Daily, and randomly, the Project Manager with help from the Environmental Coordinator, Community Relations Officer and Labor Officer) will perform the supervision of the contractor, verifying that it complies with the environmental requirements and social aspects of the Project, according to requirements proposed in this plan, as well as NREI's management plans and policies. The observations made during the verification of the contractor's performance will be documented and follow up in registration forms.

Faults or deviations from compliance of the attention procedures to environmental and social issues that do not pose a significant risk for Projects are set as Site Findings Record.
In the case of faults or deviations (i.e. environmental, social, occupational health and safety) that do represent a significant risk for the Project, these will be recorded as non-compliance and must be attended immediately. It is important to point out that each not attended non-compliance will entail an economic penalty for the contractor.

For the health and safety performance supervision, the H&S Manager will conduct the contractors' supervision to verify the compliance of all the aspects or requirements set forth in the Health and Safety Plan and related plans (e.g. Emergency Plan or the Traffic Management Plan), by documentary review and on-site inspection during the execution of the activities of the Project. Among the requirements inspected are: compliance of workers' security and health management programs, risk preventive inspections, etc.

At the end of each inspection, if any non-compliance is observed, the H&S Manager will do a Site Findings Record for future follow-ups.

During on-site inspections, if any potential hazard that endangers the physical safety of staff and facilities is observed, it will be reported immediately by the H&S Manager to eliminate the danger before resuming activities.

8.16.5.2 Follow-up Meetings

On a weekly basis, the Project Manager will hold meetings with the contractor, in order to follow-up site findings and the non-compliances that are in the process. Thus, the follow-up will ensure an adequate management.

A Health and Safety Coordination meeting will be hold on a biweekly basis. In this meeting, agreements will be established for monitoring and compliance. Relevant statistics (e.g. accidents) will be discussed.

8.16.5.3 Reports

The contractor must deliver to the Project Manager the corresponding reports of the social and environmental activities carried out. Including:

- Environmental reports (e.g. activities, relevant findings, national legislations etc.) deliver monthly;
- Social reports (e.g. activities, relevant findings, compliance to national legislation) deliver monthly.

The contractor will also submit reports regarding occupational health and safety activities to the H&S Manager on a monthly basis. Among the information that will be included in the reports are:

- Compliance with the occupational health and safety aspects established in the corresponding Project-level procedures.
- Accident Statistics Report.
- Report of compliance.

- Follow-up report and compliance of audit's findings.

8.16.5.4 Monthly Audits

The Project Manager will carry out a monthly audit to the contractor, in order to verify the existence of the documentation requested by the Project and review it. Monthly audits will be scheduled. The documentation review will be randomly as well as the Key Performance Indicators (KPIs); as a result, the level of performance of the contractor and subcontractors will be assessed. Thus, corrective measures will be defined, when applied, as well as the time of its completion.

The H&S Manager will hold monthly audits to the contractor in order to verify that activities are running according to established procedures work, in order to prevent incidents and accidents, while running the activities. The result of the audit is sent to the contractor for monitoring and compliance with the health and safety recommendations established in the audit.

8.16.5.5 Accommodation Auditing Protocol

During the initial stages of construction, the Project expects to hire local workers located within a daily commute distance of the Project site. However, several construction activities will require workers with specialty skills who will live in local hotels and accommodations. Drilling will require two 9-person crews plus NREI supervisors, during the peak of the plant construction up to 75 workers will be at the site. During operations, NREI estimates that it will have 17 employees on site, five operators per shift and a plant manager for two shifts. Most employees will be local or retrained workers from NEVLEC contractor.

The migrant workforce is not expected to be significant; however, as some local hotels and accommodations will be used to lodge migrant workers an accommodation auditing protocol will be required.

The Accommodation Auditing Protocol is a tool to verify and check on the suitability and appropriateness of housing conditions for expatriate subcontractors working on the NREI Project. The purpose of these audits is to detect, assess, support and control the problems and needs of the expatriate workers, enhancing autonomy and improving the quality of life of the worker for their better performance and productivity on the Project. The audits will be focused on the health of the expatriate workers, if the house complies with health standards, vector control standards, and has basic services (such as water, electricity, easy access to the project, and if the worker has access to transportation services).

NREI's Contractors will be responsible to carry out the Home Auditing Protocol to guarantee that the audits are completed according to what is established in this plan and that it is executed in an efficient way.

NREI's Contractors will perform at least two visits per month to a random sample of the homes. The home visit will consist of the activities listed below.

1. **Planning of the Visit**: The Contractor's staff member (such as the HR manager or ESG manager) will plan and organize the monthly visits to worker homes. The visits will be carried out every month, and will only take place on weekdays.

2. **Arrival at the house**: Once the date and time have been established, the worker is committed to be present at the house while the audit is taking place. An NREI staff member (such as the HR manager) will accompany the Contractor for the visit.
Upon their arrival, the team will greet the worker, introduce himself or herself, and personalize the contact. The number of people who live with the worker will be verified, as well as the type of housing in which he/she lives. In addition, the Contractor will verify if the house has basic services such as

water and electricity, and whether the house is located in an area where it is easy to get to the Project site, as well as if the house is in an area that represents social risk or is high in crime. The visit will be focused on studying and observing the social and family environment.

3. **Survey**: Attached as an appendix to this Plan (**Appendix 15-A**). Once the inspection has been completed, a survey form will be completed and submitted.

4. **Close of the visit**: Once the visit is over, the Contractor will present a summary report of the audit findings to the Project's ESG Manager about the visit, who will determine the actions that will be carried out according to the social report presented.

8.16.5.6 Subcontractor Monitoring by the Contractor

The contractor is responsible for the performance supervision of the subcontractor's social, environmental and occupational health and safety performance. It is responsible for their compliance, their compromises and stablished plans.

8.16.6 Documentation and Monitoring

NREI will keep a record of the following documents:

- Contractor's pre-qualification documentation;
- ESHS Plan, and any other plans, developed by the Contractor;
- Evidence of compliance with national legislation in environmental, health and safety matters, including work conditions (training certificates, medical care records, work contracts, environmental license, among others); and
- Evidence of compliance with the standards and policies established in the ESMP.

8.16.7 Key Performance Indicators

The Contractor Management and Supervision Plan is to be reviewed on a six-month basis for the initial two years and then annually or as necessary in consultation with contractors and subcontractors.

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-40: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool/ Frequency
Contractor's policies compliance	Contractor's compliance with labor conditions and policies	100% compliance with terms and conditions of employment, with human resources policy and code of conduct (or similar), with labor relations, with non-discrimination and equal opportunities and retrenchment	All Project phases	Contractor's policies and management plans / Quarterly

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool/ Frequency
Worker's Health and Safety	Number of reports generated indicating the number of accidents and incidents	100% of reported accidents (total days and hours). Correct implementation of corrective measures when applicable.	All Project phases	Contractor's Monthly Reports / Monthly
	Contractor's compliance with H&S management plans	Compliance with 100% of H&S management plans	All Project phases	Contractor's Monthly Reports and Management Plans / Monthly
Environmental and Social Impacts	Contractor's compliance with Environmental and Social management plans	Compliance with 100% of Environmental and Social management plans	All Project phases	Contractor's Monthly Reports and Management Plans / Monthly
Community Health and Safety	Contractor's compliance with the Community Health and Safety management plan	Full compliance with the Community Health and Safety management plan	All Project phases	Contractor's Monthly Reports and Management Plans / Monthly
Worker's accommodation	Compliance with the Accommodation Auditing Protocol	100% compliance with the Accommodation Auditing Protocol	All Project phases	Accommodation Auditing Protocol Checklist / Quarterly
Supervision	Number of reports, follow-up meetings and monthly audits	At least one meeting per week. At least one report per month. At least one audit per month.	All Project phases	NREI records / Weekly and Monthly

8.17 Stakeholder Engagement Plan (Exploration and Exploitation Phases)

8.17.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

Stakeholder engagement is an essential part of the Preliminary Supplemental ESIA and project development process. It ensures that stakeholders, including Project-affected communities, are provided with timely and transparent information regarding the Project, and allows stakeholders to provide input on potential issues of concern relating to the Project.

This Stakeholder Engagement Plan (SEP) outlines the program of engagement for the communities in the Project's Area of Influence, specifically in Charlestown. Development, update and implementation of this SEP are the responsibility of NREI (the Project). This SEP conforms to international good practice and has been developed to align with the IFC's Guidelines for meaningful stakeholder consultation, and to enable a positive community change through community participation. NREI acknowledges the importance of an adequate management of the environmental and social risks and impacts associated with its Project, alongside the expansion of the positive effects of its activities. NREI believes that a two-way communication and participation with internal and external stakeholders is essential for the development and success of its operations.

This SEP is designed for an ongoing exchange of information that allows the Project to 1) identify, understand and address community/stakeholders priorities and concerns, and 2) improve decision-making and transparency. Furthermore, this is an evergreen document that will evolve according to NREI's activities.

Aligned to the above, the Stakeholder Engagement Plan establishes the guidelines for the:

- Identification of Stakeholders within the Project's Area of Influence (AOI) and definition of their characteristics;
- Stakeholder Mapping and prioritization of stakeholders;
- Disclosure of information and community participation;
- Defining the appropriate communication tools;
- Scheduling communication and engagement activities; and
- Keeping a record of the interactions with stakeholders.

8.17.1.1 Objective

This SEP has been developed to meet the expectations of the company, regulators and the communities. The SEP describes the stakeholder identification process and outlines an engagement program to promote meaningful, timely and effective engagement with stakeholders. It builds on previous engagement efforts, such as the public consultation carried out in June of 2017.

Engaging stakeholders is an important aspect of managing ongoing social and environmental performance and non-technical risks. The objectives of stakeholder engagement are to:

- Promote the development of respectful and open relationships between stakeholders and NREI;
- Identify stakeholders and understand their interests, concerns and influence in relation to ongoing activities;
- Provide stakeholders, both interested and affected stakeholders, with timely information about the Project's activities, in ways that are appropriate to their interests and needs;
- Guarantee the active participation and consultation of the stakeholders throughout the life of the Project. During the consultations there will not be any form of manipulation, interference, coercion or external intimidation;
- Support alignment with the international requirements, corporate standards and guidelines for stakeholder engagement;
- Record feedback and resolve any grievances that may arise through a formal feedback mechanism;
- Identify the resources and responsibilities for the SEP execution, including the monitoring activities; and
- Monitor and evaluate the actions carried out to adapt or modify the SEP as necessary.

8.17.1.2 Scope of Application

This plan will apply during the development of NREI's activities and during the Project's life cycle. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's Environmental and Social Management Plans (ESMP) policies and procedures, which are aligned to international best practices.

Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific Environmental and Social Management Plans (ESMP) will be applied on the ground. NREI will review and approve this document before any implementation.

The geographical scope of the stakeholder engagement plan is described by the Project's Area of Influence, which comprises Charlestown (in the Area of Direct Influence, ADI) and the entire island of Nevis (which is the Area of Indirect Influence (AII).

8.17.2 Roles and Responsibilities

In order to properly implement the Stakeholder Engagement Plan, NREI requires the involvement of the people listed below.

Table 8-41: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Stakeholder Engagement Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Stakeholder Engagement Plan.
Marketing and Communications Manager	■ Assist in the implementation of the Stakeholder Engagement Plan.
Project Manager	■ Be familiarized with the Stakeholder Engagement Plan and provide the necessary resources to ensure its proper implementation.

Role	Responsibilities
ESG Manager	■ Comply with this plan and coordinate, together with the Community Relations Officer, the implementation of the relationship and communication actions. ■ Review and approve the contractor project-specific Stakeholder Engagement Plan. ■ Review and update the Stakeholder Engagement Plan.
Labor Officer	■ Assure the communication of relevant information to internal stakeholders.
Community Relations Officer	■ Implement the Stakeholder Engagement Plan. ■ Coordinate, together with the ESG Manager, the implementation of the relationship and communication actions. ■ Ensure a constant communication channel with the Project Stakeholders.
Contractor Company	■ Develop a project-specific Stakeholder Engagement Plan.
NREI's employees, contractors and subcontractors	■ Read and be familiarized with the Stakeholder Engagement Plan.

Source: NREI, 2020

8.17.3 Activities

The identification, mapping and analysis of stakeholders will be a dynamic and continuous exercise in the execution of any project, since it allows a deep understanding of its context and guarantees the effectiveness and adaptation of engagement strategies. The activities found in this SEP establish the guidelines for the management of external communication channels, as well as the mechanisms to manage the participation of interested stakeholders.

8.17.3.1 Stakeholder Identification

The identification of stakeholders is essential, since it provides the basis for designing the relationship strategies with each interest group in order to achieve the greatest possible participation and social acceptance. To the extent that as the participation and acceptance grows, social impacts and risks may be minimized in greater proportion.

Likewise, the mapping helps to define which interest and affected groups NREI will contact and how to manage the risks. This section of the SEP focuses on the stakeholder identification and mapping identified for the early stages of the Project.

Considering previous experiences, direct sources of information (e.g. interviews, surveys) and publicly available information, the Project's stakeholders have been identified by:

- Analyzing who could be affected by the Project activities and how. For doing so, the Project geographical location as well as its activities and potential impacts will be considered (e.g. primary site, related facilities, transport routes, etc.);
- Avoiding limited criteria for the identification of stakeholders affected and prioritizing groups of neighboring people;
- Phone interviews were carried out with different stakeholders.

Methodology

One of the first steps in stakeholder engagement planning is the identification of stakeholders. Stakeholders typically include government officials, regulators, members of the community and public at large, Non-Governmental Organizations (NGOs) and civic leaders, media, employees and contractors, and industry

associations. Stakeholders can be individuals working on a project, groups of people or organizations, or even segments or sectors of a population. A stakeholder may be actively involved in a project's work, affected by the project's outcome, or in a position to affect the project's success.

After identifying the stakeholders, it is key to understand their needs and expectations for engagement, and their priorities and objectives in relation to the Project.

As part of this process, it is particularly important to identify individuals and groups who may find it more difficult to participate and those who may be differentially or disproportionately affected by the project because of their marginalized or vulnerable status. It is also important to understand how stakeholders may be affected – or perceive they may be affected – so that ongoing engagement can be tailored to inform them in an appropriate manner and address their views and concerns.

While an interest in an effort or organization could be just that – intellectually, academically, philosophically, or politically motivated attention – stakeholders are generally said to have an interest in an effort or organization based on whether they can affect or be affected by it. The more they stand to benefit or lose by it, the stronger their interest is likely to be; and the more heavily involved they are in the effort or organization, the stronger their interest is as well.

Stakeholders' interests can be many and varied. A few of the more common interests include:

- Labor
- Social Change
- Economics
- Indigenous Peoples Rights
- Environment
- Natural Resources
- Safety and Security

The identification of stakeholder groups for NREI was made through publicly available information, local knowledge from the Project team and data collected during the ERM phone interviews with stakeholders carried out in June 2020. The stakeholder groups have been "mapped" according to their influence, interest and probable position in relation to the Project. This assignment is based on knowledge of the social, cultural, political, environmental, and factors associated with the development of the Project.

Vulnerable groups who may be differentially or disproportionately affected by the Project because of their disadvantaged or vulnerable status have also been identified as part of the stakeholder mapping. This group of affected stakeholders was determined based on factors, data and status of gender, ethnicity, culture, physical or mental disability, poverty or economic disadvantage and dependence on unique natural resources.

Once the stakeholder groups were identified, their position, interest and influence regarding the Project were evaluated. The position has been defined as the degree of acceptance by the interest group towards NREI. The criteria are presented in the table below.

Table 8-42: Assessment of Position Criteria

Assessment	Position
In favor	The interest group's position in relation to the Project is favorable; given that it perceives that, it has or will have a positive performance in relation to its topics of interest.

Assessment	Position
Neutral	The stakeholder's position in relation to the Project is neutral, indefinite. You may have the expectation that he/she will have a position to minimize the existing impacts. However, he/she needs more information, since it is not clear to him/her how the Project will be developed in the future.
Against	The position of the group of interest in relation to the Project is unfavorable, since it identifies more negative aspects than positive ones in the current or future development of the Project.

Source: ERM, 2020

The interest has been defined as the stakeholder's interest degree that he/she has on the issues associated with NREI. The evaluation criteria are presented below.

Table 8-43: Interest Evaluation Criteria

Assessment	Interest Position
Low	The interested party does not know or recognizes few links between the Project and their own interests, and shows little interest in knowing more about it.
Average	The interested party recognizes some relations between the Project and its interests.
High	The interested party recognizes a set of common interests with the Project and shows a strong interest to know more information about it.

Source: ERM, 2020

Finally, the influence has been defined as the degree of articulation with other actors and the capacity to generate mobilization as seen on the table below.

Table 8-44: Influence Evaluation Criteria

Assessment	Influence Position
Low	The interested party has little capacity for mobilization and/or few networks and relationships with local actors.
Average	The interested party has the ability to articulate and mobilize media, exerts influence in social networks with important connections with local actors such as inhabitants, workers, tourists, politicians, among others.
High	The interested party has a high capacity for articulation and mobilization with significant local networks and actors such as inhabitants, workers, tourists, politicians, among others.

Source: ERM, 2020

The identification and mapping of stakeholder groups is presented in the sections below.

Stakeholder Groups

Stakeholder groups are individuals, groups or institutions that have a stake or a particular interest in the Project. They may be affected by it (either positively or negatively) or they may have an interest in it and be in a position to influence its outcomes. Therefore, the stakeholder groups have been classified as:

- Interested groups, which can be Project beneficiaries and commonly favor the Project; and
- Affected groups, which are individuals or groups adversely affected by the Project and consequently some might oppose the Project.

The Project will follow a different consultation rationale per stakeholder group. The Project will closely monitor, engage and consult the affected groups in the AOI. Meetings with these groups, described below, are prioritized by the Project. On the other hand, the Project engages with interested groups to keep them informed about the Project, to collaborate in topics related to common issues, such as health and safety measures, and provide specific information when they request it. While the consultation rationale towards interested groups is not as intense and frequent as with the affected groups, NREI is committed to maintain a close relationship and frequent communication with government entities and financial institutions, among others.

Table 8-45: Affected and Interested Stakeholder Groups in the Project's AOI

Affected Stakeholder Groups	Interested Stakeholder Groups
Communities in the Area of Influence and landowners near the Project site: Residential communities in the Project's wider socio-economic Study Area. Several land plots and houses have been identified near the Project site, in addition to the Carino Hamilton Estate.	***Government entities relevant to the Project:*** Government agencies, elected officials and public service providers that may be at the local or national levels.
Tourism sector: This sector includes different groups within the sector such as, the Four Seasons Resort, Bananas Bistro, and the Nevis Tourism Authority.	***Neighboring Projects:*** Includes neighboring companies located on the same industrial area where the Project will be located and are carrying activities near the Project, such as, the Water Department's tank storage project.
Vulnerable groups in the AOI: This stakeholder group could include women, children and elderly, indigenous people, families and individuals in extreme poverty, people with physical and psychological disabilities, and individuals that depend on natural resources. These groups are commonly more vulnerable to social inequality. In addition, vulnerable groups have a higher sensitivity to potential Project impacts, in many cases do not have the means to defend their interests and concerns and it is more challenging for them to benefit from the Project's benefits.	***Financial Institutions:*** Financial Institutions that will finance the Project.
NGOs, Associations and civil organizations: Local and regional NGOs and associations that could generate opinions about the development of the Project or that could participate in conflict resolution that could take place within the communities, such as, the St. John Community Improvement Club and the Nevis Historical and Conservation Society.	***Mass media:*** It refers to media present in the Area of Influence, including social media platforms linked to the Project. Some media sources include SKN News or Voice of Nevis radio.
	Contractors: It includes NREI's contractors and sub-contractors.

Affected Stakeholder Groups	Interested Stakeholder Groups
	Workers and Staff: It includes all of NREI's workers and staff.

Source: ERM, 2020

Stakeholder Analysis

The table below presents each stakeholder group description, identified actors, and their potential position, interest and influence. 10 categories of interest groups have been identified: i) Communities and landowners in the Area of Influence, ii) Neighboring Projects, iii) Tourism Sector, iv) Government Entities, v) NGOs and Associations, vi) Financial Institutions, vii) Mass Media, viii) Contractors, ix) Workers, and x) Vulnerable Groups.

- NIA
- Chamber of Industry and Commerce
- Christian Council and Evangelical Association / any churches such as the Crossroad Community Church
- Nevis Tourism Authority
- HOPE Youth Group (Ron Daniel / members of the youth group)
- Nevis Cultural Heritage and Conservation Society
- St. John's Community Improvement Club
- Nevis Solid Waste Management Authority
- NASPA
- NEVLEC
- Bananas Bistro
- Four Seasons Resort
- Individuals and landowners around the Project Site
- Individuals such as construction workers, heavy equipment operators, truckers, etc. that may be employed by the Project

Table 8-46: Analysis and Identification of Stakeholder Groups

Stakeholder Group	Description	Identified Actors	Potential Position (Against, Neutral, In favor)	Interest (Low, Average, High)	Influence (Low, Average, High)
Communities in the Area of Influence and landowners near the Project Site	It refers to those locations that are within the perimeter of the Project or neighboring areas and may be affected by the Project.	■ Carino Hamilton Estate	Against	High	Average
Local Authorities and Government entities relevant to the Project	It refers to Nevis island authorities that might be affected by the Project.	■ NIA, NASPA, Nevis Solid Waste Management Authority	In favor	High	High
Tourism Sector	Businesses in the tourism sector, such as restaurants, hotels, or the tourism department.	■ Bananas Bistro, Four Seasons Resort, Nevis Tourism Authority	Neutral	Average	High
Neighboring Projects	Refers to any projects that are being developed by the Project site	■ Water Department tanks projects	Neutral	Low	Average
Vulnerable Groups in the AOI	This category includes identified vulnerable groups in the AOI	■ Women, children and elderly ■ Families and individuals in extreme poverty ■ People with physical and psychological disabilities ■ Individuals that depend on natural resources	Neutral	Low	Low
NGOs and Associations	Local and regional ONGs and associations that could generate opinions about the development of the Project or that could participate in conflict resolution that could take place within the communities.	■ St. John Community Improvement Club ■ Nevis Historical and Conservation Society	Neutral	Average	Average
Contractors	It includes NREI's contractors and sub-contractors.	■ The Project's clients, suppliers, contractors and subcontractors. They will be defined once the Project begins.	Neutral	Average	Average
Workers and Staff	It includes all of NREI's workers and staff.	■ The Project's workers.	In favor	High	Low
Financial Institutions	Includes financial institutions interested in financing the Project	■ Inter-American Development Bank ■ Caribbean Development Bank	Neutral	High	High

Stakeholder Group	Description	Identified Actors	Potential Position (Against, Neutral, In favor)	Interest (Low, Average, High)	Influence (Low, Average, High)
Mass Media	Includes mass media in the Project area.	■ SKN News ■ Voice of Nevis Radio	Neutral	Average	High

The following figure shows the identified actors that have bene engaged with and their probable position and influence on the Project according to the qualitative analysis.

The categories of stakeholder groups were assigned in an X-Y axis according to their position (X-axis) and the influence (Y-axis) with respect to the Project. A qualitative mapping criteria scale was applied in order to position the stakeholders on the X-Y axis. The level of influence of each interest group was determined as High, Average or Low. Just as the probable position was determined as *Positive* (grey), *Negative* (blue) or *Neutral* (light blue).

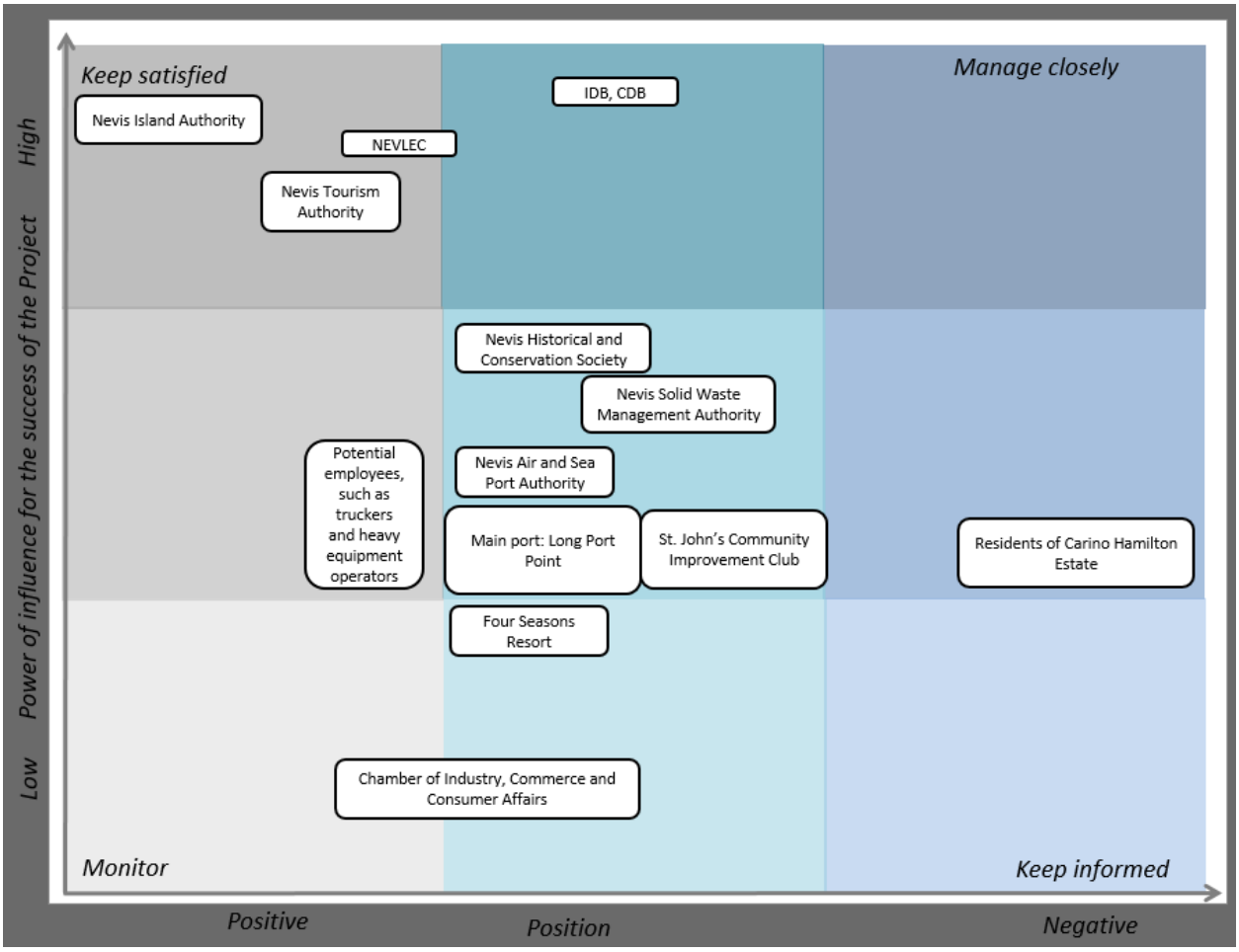


Figure 8-8: Mapping of the Stakeholder Groups

8.17.3.2 Community Participation

Effective participation requires sharing information related to the Project with affected communities and other key stakeholders, facilitating a well-informed consultation process and the contribution of interested citizens to the design and planning of the Project.

In order to promote a better understanding of the Project and instill confidence among its stakeholders, NREI will ensure transparency in the communication of relevant information by:

- Disclosing information on a timely manner;

- Disclosing relevant information by managing expectations adequately (e.g. employment opportunities) and avoiding downplaying the potential negative aspects (e.g. inconvenience during the construction phase);
- Disclosing relevant information in a culturally appropriated manner to facilitate the participation of local population;
- Disclosing information in a way that supports the consultation process, allowing enough time to pass between the communication of information and the start of the consultations.
- Disclosing the existence of the External Grievance Mechanism and its communication channels.

Public Consultation (2017)

Stakeholder engagement and outreach activities have been carried out by the Project since 2017. Since this date, the Project has carried out some consultation activities to provide the public with information about the Project and its potential impacts, to elicit public input and feedback on various Project aspects and access local knowledge on baseline environmental, social and health conditions in the Project area communities. These activities included:

- The 2017 EIA was posted for public comment in the Nevis Public Library in Charlestown on May 15, 2017. No written comments were received from interested parties.
- A one-hour call-in session was held on the Nevis Radio station, on Wednesday, June 14, 2017, hosted by the Honorable Mark Brantley, the Deputy Premier.

In addition, a formal public consultation, advertised in the local newspaper, was held in Charlestown on June 17, 2017. Approximately 200 people attended the meeting. Questions focused on when the project will start, how long will construction take and if the geothermal plant will reduce the cost of electricity. A local reporter was concerned about the use of a flammable working fluid, cyclopentane. The response discussed the double-walled tank and spill containment structure, air monitoring as well as the fire protection equipment and procedures on site. The reporter was satisfied and indicated that he had no further questions. A solar representative recommended solar panels as an alternative to the Project. The answer provided highlighted that solar panels could not operate at night and will not displace all the diesel-fired generation that the proposed Project will displace.

Lastly, stakeholder engagement was conducted with 16 landowners near the Project site in February 2017, and follow-up interviews were conducted in May 2018 (see Table and Figure below for details). For one landowner who is particularly close to the site, the first engagement took place in June 2016 and then periodically every three months until December 2019. The Project also engaged with the nearby business Bananas Bistro, whose owner was concerned about visual impacts.

Table 8-47: Summary of NREI Interviews with Key Stakeholders

Date contacted	Nearby Property Owners	Comments	Follow up actions
Contacted by M. Tross, Feb 2017 follow-up May 2018, several other contacts	#1	No residences on site. Land use is limited to approximately 30 acres in northeast direction from site cleared for limited grazing and gardening. Total land ownership exceeds 300 acres. No problem with project.	None

Date contacted	Nearby Property Owners	Comments	Follow up actions
Contacted by M. Tross, Feb 2017 follow-up May 2018	#2	Cleared grazing land, no residences, one outbuilding on site. Land is for sale. Conducted noise monitoring during Feb, 2018. No objections to project.	Follow-up if land acquisition is desirable
Contacted by M. Tross, Feb 2017 follow-up May 2018	#3	Uncleared vacant land. Owner is interested in selling property to project. No objections to project.	Follow-up if land acquisition is desirable
Contacted by M. Tross, Feb 2017 follow-up May 2018	#4	West of site, separated from site by other property. Uncleared vacant land.	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	#5	West of site, separated from site by other property. Uncleared vacant land.	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	#6	West of property. Separated from site by unknown property to east. Land is undeveloped, vacant.	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	NHLDC Property	Southwest of site, undeveloped land owned by NIA	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	#7	Southwest of site, separated from site by Hamilton Heritage land and NHLDC land. One residence on site. No objection to project.	Contact again prior to developing HHT parcel to south where injection wells will be installed.
Not available.	Hamilton Heritage Trust	6 small parcels of land held by NIA. No active residences. One unit in southwest has been dedicated to the geothermal project for installation of the injection wells. This 1.1-acre parcel contains abandoned and dilapidated building that was a former stable. Building will be demolished during construction of plant.	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	#8	South of plant site separated from plant site by HHT land and other parcel. Uncleared vacant land. No structures or roads on property.	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	Carino Hamilton Company LTD	3 story condo/apartment property. Separated from plant site by 2 HHT parcels and privately-owned parcel. Landowner objected to Project. Stakeholder mentioned that they are involved in the sale of solar panels.	Useful to keep landowner informed of progress and address concerns as they arise
Contacted by M. Tross, Feb 2017 follow-up May 2018	#9	Uncleared vacant land adjacent to southeast boundary of property.	None

Date contacted	Nearby Property Owners	Comments	Follow up actions
Contacted by B. Cutright, June 2016, and periodically every 3 months until December, 2019.	Bananas Restaurant	Well known restaurant to southeast of plant site. Owner was concerned with visual impact of plant. No objections to plant as it is seen as a benefit to reducing the cost of electricity. Provided line-of-site study to owner to illustrate no or limited impact upon completion of construction. Conducted noise monitoring during installation of N-4 well.	Owner is involved in the community and very supportive. NREI to keep in contact and keep owner informed regularly on progress. May arrange tours for customers to maintain support.
Contacted by M. Tross, Feb 2017 follow-up May 2018	#10	Uncleared vacant land. No objections to Project.	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	#11	Uncleared vacant land. No objections to Project	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	#12	Adjacent to west property boundary. Uncleared vacant land. No contact with owner.	None
Contacted by M. Tross, Feb 2017 follow-up May 2018	#13	Adjacent to west property boundary. Uncleared vacant land.	Useful to contact in future for general communications.
Contacted by B. Cutright, June 2016, and periodically every 3 months until December, 2019.	#14	Property is adjacent to and northeast of plant site. Met with owner several times before, during and after installation of N-4 Test well. Have no objections to project but were concerned about losing vegetation along the boundaries of their property, and thus the privacy of their back yard. NREI monitored noise levels on each visit.	NREI to contact regularly to keep informed of progress. Plant layout and design maintains 50-foot vegetation buffer along north and east plant grounds to ensure visual and acoustic buffer between plant and property.

Figure 8-9: Parcels Around the Project

Phone Interviews with Stakeholders (2020)

As part of the Project's recent stakeholder engagement efforts, ERM Consulting team carried out phone interviews with a number of key stakeholders. The table below presents a summary of each conversation, focusing on their knowledge about the Project, their concerns, comments and questions.

Table 8-48: Summary of Phone Interviews with Key Stakeholders

Stakeholder group or individual	Does the stakeholder know about the Project? If so, what?	Concerns, comments, questions, suggestions
The Four Seasons Resort	Yes, that it is being built and there was talk about it in 2016. There was a well-built last year.	■ Would like it to continue progressing.
NASPA	Yes, that it is being built and there is a lot of interest around geothermal energy. The Project has an agreement with the government to use the cargo port.	■ None.
Lefco Construction	Yes, that it is being built.	■ Interested in the Project continuing.
NEVLEC	Yes, that it is under construction and there is a Purchase Power Agreement.	■ Some concerns with the terms of the PPA.
NIA	Yes, that the Project is under construction.	■ Interested in the Project moving forward.
Carino Hamilton Estate Resident #1	Yes, that it is being built.	■ Against the Project location; does not understand why it is located there; is wary of risks associated with geothermal energy and wants more information.
Carino Hamilton Estate Resident #2	No, was not aware of it until now.	■ Extremely concerned about the Project, wants more information about it.
St. John's Community Improvement Club	Yes, that it is being built.	■ None.
Nevis Solid Waste Management Authority	Yes, that it is being built.	■ None.
Nevis Historical and Conservation Society	Yes, that it is being built.	■ The dissemination of EIAs requires a communication strategy so that all sections of the population are informed of the process.
Heavy Equipment Operator	Yes, that it is built	■ None.
Chamber of Industry and Commerce	Yes: Explorations has been done quite a few years ago. Three (3) Wells were dug at Hamilton, Fountain and Tower Hill. The Hamilton Well was most viable. A Generating Plant was to be constructed but has not been done due to lack of financing.	■ None.

Source: ERM, 2020

Disclosure of Information

The Project will select which information will be communicated, taking into account the following:

- Project phase, activities and schedule;
- Analysis of previous interactions between NREI and the stakeholders;
- Area where the information will be communicated;
- Stakeholder type (affected vs. interested and considering their potential influence and position regarding the Project);
- Tool chosen to share the information;
- Type of information to be communicated;
- Date of communication; and
- Responsible for sharing the information (whether NREI or a contractor).

The Community Relations Officer, together with NREI Management, will select what type of environmental, social, or occupational or community health and safety documentation regarding the Project's phases and activities will be communicated. This information will be confirmed with the contractor at each site and addressed taking into account the identified key stakeholders.

The main topics to consider during engagement activities with stakeholders are:

- Project status update: Publicize all the activities and stages of the Project;
- Project objectives in the short, medium and long term, to avoid creating misguided expectations among stakeholders;
- Information and update regarding positive and negative impacts, when applicable: Provide information on the impacts generated during each phase of the Project, as well as the mitigation measures to be implemented or already being implemented;
- Grievance mechanism: take into consideration the opinions of stakeholders to continually improve the external grievance mechanism procedures (e.g. preferred location of grievance boxes), and continue to reinforce its communication, according to positive or negative experiences;
- Emergency Plan and Community Health and Safety Plan: Share the procedures of the Project Emergency Plan and the Community Health and Safety Plan to all communities and related stakeholders for their knowledge and implementation;
- Aspects of the Project that have attracted stakeholders' attention: Contemplate the opportunity to learn about the perception of stakeholders that may not have been formally transmitted through the grievance mechanism (e.g. retrenchment plans of the Project);
- Invitations to meetings or information communication sessions where general information on the Project will be provided (stages, activities, times); and
- Other relevant plans such as the, Traffic Management Plan.

The Project will keep photographic evidence of all the relevant activities carried out with stakeholders as well as Project related developments (e.g., construction development, labor training, flora and fauna rescue and preservation activities). This will complement the communication process with stakeholders.

NREI is aware that the lack of information can lead to an erroneous perception of the Project, and trust from local communities may be affected. NREI will continue to share and distribute meaningful and relevant information among the Project's stakeholders throughout the Project's life cycle.

In order to do this, the Project will build solid relationships with external stakeholders (e.g. government institutions, universities, other academic entities) who can help NREI to be known among local communities and people directly or indirectly involved in the Project (e.g. through press announcements). NREI will work with these stakeholders to perform actions that could represent an improvement in the quality of life of community members and/or the region where the Project is located.

Depending on the type of stakeholder the means of communication will be defined, such as through the Project's website, by phone, mems, letters, email, informative sessions or meetings, brochures and copies of relevant documents placed in accessible and strategic locations.

Consultation and Participation Action Plan

Public consultation is a process that promotes a two-way dialogue between local communities and the Project, which will aim to ensure the establishment and maintenance of constructive relationships throughout the life of the Project. For local communities, the consultation process offers the opportunity to obtain information about the Project's activities, to update the company of the local context in which the Project is framed, to share problems and concerns, to ask questions and even, to make suggestions.

The consultation process and participation plan with local communities will follow the five basic steps detailed below, which can be repeated as many times as necessary throughout the different phases of the Project.

1. Plan ahead, before beginning a process of consultation with local communities, it will be clear who will be consulted, on what issues and for what purpose;
2. Conduct the consultations applying the basic principles of the recommended practices and adapted to the local situation and to the local communities;
3. Consider the opinions and observations received and make every effort to resolve the issues raised;
4. Document the consultation process and its results;
5. Prepare reports for stakeholders, in order to keep them informed about which of the concerns raised will be addressed and how, and explain what suggestions have not been taken into account and the reasons, so as to promote credibility, control expectations and maintain interest.

The table below presents the consultation and participation plan per each stakeholder group. The table includes the consultation and participation methods, the consultation topics, shared information and objectives, the Project phase and frequency, the priority and person in charge.

Engagement in Extraordinary Situations

NREI will endeavor to maintain engagement with stakeholders throughout the project's continuity. In the case of health-related crises, pandemics and or epidemics, NREI will develop, when necessary, an action plan for engagement with stakeholders in this scenario.

The action plan must be developed in order to guide NREI's performance during this period, and must contain at least the following items: (i) target audience; (ii) organizational structure; (iii) communication channels; (iv) risk prevention and mitigation measures for the teams involved in the engagement actions; and (v) list of actions.

Table 8-49: Consultation and Participation Action Plan

Stakeholder Groups	Consultation and Participation Methods	Consultation Topics, Shared Information and Objectives	Project Phase and Frequency	Priority	Person in Charge
Interested Stakeholder Groups					
Government entities	Meetings with representatives, either in groups or individually	■ Identify any concerns regarding Project impacts and progress ■ Answer their questions regarding the Project ■ Receive feedback about the Project's social management plans, health and safety measures, community communications and community grievance mechanism	Construction: At least once a month Operations: at least once per six months	High	Community Relations Officer
Neighboring Projects	Meetings with Water Department		Construction: At least bi-monthly Operations: at least once per six months	Medium	Community Relations Officer
Financial Institutions	Meetings with representatives, either in groups or individually		Construction: At least once a month Operations: at least once per six months	High	H&S Manager
Mass media	Meetings with representatives, either in groups or individually		Construction: At least bi-monthly Operations: at least once per six months	Medium	Community Relations Officer
Workers	Meetings with representatives, either in groups or individually		Construction: At least once a month Operations: at least once per six months	High	HR Manager
Contractors	Meetings with representatives, either in groups or individually		Construction: At least once a month Operations: at least once per six months	High	HR Manager
Affected Stakeholder Groups					
Communities and landowners near the Project site	Group meetings (virtually) with people from nearby residences, including women, young people and other vulnerable groups	■ Identify any concerns regarding Project impacts and progress ■ Answer their questions regarding the Project ■ Receive feedback about the Project's social management plans, health and safety measures, community communications and community grievance mechanism	Construction: At least once a month Operations: at least once per six months	High	Community Relations Officer
Tourism sector	Meetings with tourism representatives, either in groups or individually		Construction: At least bi-monthly Operations: at least once per six months	Medium	Community Relations Officer

Stakeholder Groups	Consultation and Participation Methods	Consultation Topics, Shared Information and Objectives	Project Phase and Frequency	Priority	Person in Charge
Vulnerable populations in the Area of Influence	Vulnerable groups will be invited and encouraged to attend the community meetings If a group identifies a need to meet with the Project, the Project will organize an individual meeting with the person or particular group.		Construction: At least once a month Operations: at least once per six months	High	Community Relations Officer
NGOs	Meetings or communication exchange by email or phone call	■ Identify their concerns regarding the Project's impacts and progress ■ Answer their questions regarding the Project ■ Receive feedback about the Project's social management plans, health and safety measures, community communications and community grievance mechanism ■ Discuss collaboration opportunities (e.g. environmental and social programs)	Construction: At least bi-monthly Operations: at least once per six months	Medium	Community Relations Officer

8.17.3.3 Registration Process: Stakeholder Database

Every time a communication or activity is carried out with any stakeholder, the Community Relations Officer will register the details in the Stakeholder Engagement Database, see **Appendix 16-A**, in order to reflect the development of the relationship with each stakeholder and the evolution of the respective negotiations.

The stakeholders' database will include a summary of each contact, participants, issues or agreements with stakeholders, including, but not limited to:

- Stage and activity of the Project;
- Stakeholder being represented;
- Type of interaction;
- Date of interaction;
- Place of the interaction;
- Background of the interaction with the stakeholder (if applicable);

- Reason for the interaction (e.g. information disclosure, follow-up meeting);
- Type of information provided (if applicable); and
- Reference to evidence supporting the interaction (e.g., minutes, photographs).

In the event that complaints or feedback are received, these will be dealt through the External Grievance Mechanism (see the External Grievance Mechanism Plan) as appropriate.

8.17.4 Documentation and Monitoring

Evidence of meetings and interactions with stakeholders will be maintained through the Stakeholder Engagement Database. When possible, evidence will be collected, such meeting minutes, videos, attendance lists and photographic evidence. The Community Relations Officer will be responsible to maintain the documentation and records.

8.17.5 Key Performance Indicators

The Stakeholder Engagement Management Plan is to be reviewed on a six-month basis for the initial two years and then annually or as necessary in consultation with key stakeholders.

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-50: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
External Grievance Mechanism	Number of confirmed grievances by community	Total number reducing each year	Construction, Operations	External Grievance Database / Quarterly
	Number of confirmed grievances resolved in a timely manner	100%	Construction, Operations	External Grievance Database / Quarterly
	Audit the grievance mechanism to ensure implementation and that grievances are being adequately addressed	Every six months, the first two years, and then once a year.	Construction, Operations	Community Relations Officer / Yearly
Local Community & Stakeholders	Number of resolved incidents involving local community members	100% resolved incidents	Construction, Operations	Stakeholder Engagement Database, External Grievance Database and the Community Relations Officer / Quarterly
	Number of consultation and participation activities	100% reported meetings and activities, with evidence when possible	Construction, Operations	Stakeholder Engagement Database and the Community Relations Officer / Quarterly
	Type, materials and methods of Disclosure of Information	Cover 100% of the relevant topics as established in the Consultation and	Construction, Operations	Stakeholder Engagement Database and the Community Relations Officer / Quarterly

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
		Participation Action Plan		
	Report back and feedback to the local community and stakeholders when needed (e.g. implementation of the grievance mechanism, conflicts solved and implemented solutions, etc.)	Delivery of reports to the community and communication channel chosen	Construction, Operations	Community Relations Officer / Quarterly
	Audit the stakeholder engagement activities	Every six months, the first two years, and then once a year.	Construction, Operations	Community Relations Officer / Yearly
Community Relations Staff/ Team	NREI will monitor the number of new community relations staff and staff changes per period. This will be reported on the community engagement performance report.	Every six months.	Construction, Operations	Community Relations Officer / Quarterly

8.18 COVID-19 Contingency Plan (Exploration and Exploitation Phases)

8.18.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plans (ESMP) policies and procedures.

This plan aims to establish good practices to be adopted by the Project with regards to the current new coronavirus (COVID-19) pandemic, including minimum procedures and strategies that must be observed by NREI, its subsidiaries and its employees. NREI aims to develop its activities in safe conditions, especially concerning health and safety conditions, as well as preserving its jobs and activities.

This document will be shared with NREI's contractors and subcontractors to incorporate the presented best practices throughout all their activities.

8.18.2 Objective

The overall objectives of the Labor Conditions and Workers Selection Plan are to:

- Define guidelines and practices regarding COVID-19;
- Establish procedures and strategies to contain and protect workers, contractors and subsidiaries from COVID-19;
- Develop activities in healthy and safe conditions;
- Promote fair treatment, non-discrimination and equal opportunity of workers, and compliance with healthy and safe (H&S) working conditions; and
- Protect workers', contractors' and local community members' wellbeing, health and safety.

8.18.2.1 Scope of Application

This plan will apply for the duration of the pandemic while the development of NREI's activities take place. It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to NREI's Environmental and Social Management Plan (ESMP) policies and procedures, which are aligned to international best practices.

Contractors will use this plan and develop it further to provide specifics on how the various requirements from the project-specific ESMP and COVID-19 measures will be applied on the ground. NREI will review and approve this document before any implementation.

8.18.3 Roles and Responsibilities

In order to properly implement the COVID-19 Contingency Plan, NREI requires the involvement of the people listed below.

Table 8-51: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the COVID-19 Contingency Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the COVID-19 Contingency Plan.
Project Manager	■ Be familiarized with, review and update as necessary the COVID-19 Contingency Plan.
ESG Manager and HR Manager	■ Be familiarized and implement the COVID-19 Contingency Plan. ■ Review, evaluate and verify the COVID-19 Contingency Plan. ■ Review and approve the contractor project-specific COVID-19 Contingency Plan. ■ Update the COVID-19 Contingency Plan.
H&S Manager	■ Review, evaluate and verify the COVID-19 Contingency Plan. ■ Assure the development of an Emergency Preparedness and Response Plan for each Project ■ Present, alongside the Community Relations Officer, a monitoring report to the Project Manager.
Community Relations Officer	■ Coordinate and supervise the communication of information activities regarding this plan to the affected communities. ■ Present, alongside the H&S Manager, a monitoring report to the Project Manager.
Contractor Company	■ Develop a project-specific COVID-19 Contingency Plan.
NREI's employees, contractors and subcontractors	■ Read and be familiarized with the COVID-19 Contingency Plan. ■ Develop a project-specific COVID-19 Contingency Plan.

Source: NREI, 2020

8.18.4 Activities

NREI acknowledges the importance of basic rights of workers and the value of a solid worker-manager relationship, which will be achieved through a fair treat to direct and indirect workers and the provision of health and safety (H&S) working conditions.

In order to do so, NREI has developed the Labor Conditions and Workers Selection Plan, which is composed of the steps presented herein.

In the light of the declaration of Public Health Emergency of International Importance (ESPII) by the World Health Organization (WHO) in January 2020, international, national and local health authorities have issued a series of recommendations. NREI will adopt and recommend preventive and mitigating measures as well as best practices as described below throughout the Project's development and implementation and its corporate activities.

The best practices and recommendations are directed to prevent the spread and contagion of COVID-19 in the work environment and work activities. NREI is committed to maintain safe working conditions for the people involved in the development and implementation of the Project, especially for those people whose activities and functions require face-to-face action.

8.18.4.1 NREI COVID-19 Committee

NREI will designate an internal COVID-19 Committee to:

- Provide support and information to assist the NREI Directors' decision-making process regarding crisis management related to COVID-19.

- Define and monitor the guidelines for this Contingency Plan and its updates.
- Call meetings and disseminate the results to all participants.
- Archive the documents generated in the execution of the contingency plan and other actions related to COVID-19.
- Ensure the active participation of all NREI areas involved in the Committee.

The COVID-19 Committee may suggest the creation of specific Working Groups, including groups between NREI and its contractors in order to monitor compliance with actions to control the spread of the virus among workers and the community; or other actions such as enabling communication between the Project and contractors and subcontractors, among others.

8.18.4.2 Monitoring of normative acts and COVID-19 cases

Daily, through the COVID-19 committee and their regulatory and legal areas, NREI will monitor the measures adopted by the National and Public Administration entities to contain the spread of COVID-19, strengthen the health system and safeguard the economy. All information will be shared on internal communication channels and serve as a reference for adapting measures to prevent and respond to the pandemic internally.

NREI's COVID-19 committee will monitor the number and location of COVID-19 cases in the world, especially in the Caribbean region, in St. Kitts and Nevis, and locally in Charlestown on a daily basis. When necessary, and taking into the account the evolution of the statistics, this Contingency Plan will be further adjusted to prevent and respond to the pandemic in the Project's areas of influence.

8.18.4.3 Disclosure of Information

NREI will reinforce the importance of communication and information disclosure and trainings to reduce the risks of COVID-19 both internally (workers and contractors) and for the nearby communities in the Project's areas of influence. NREI will adopt the following main initiatives:

- Reinforcement of communications and information disclosure on best practices for preventing COVID-19 transmission, especially regarding specific recommendations on social distancing and hygiene measures;
- Training of teams to be able to recognize the COVID-19 symptoms;
- Identification of the Project's focal points and communication channels (WhatsApp, e-mail, internal social network, internal grievance mechanism) to address workers' concerns about COVID-19 on a regular basis;
- Creation of a specific working group in charge of the institutional communication actions between NREI and its contractors; and
- Adaptation of NREI's internal communication materials and those of the contractors to distribute them to external stakeholders, as a way of reinforcing social responsibility and the joint work between NREI and its contractors.

As long as there are preventive measures and recommended guidelines from the health authorities in favor of social distance, NREI will suspend activities that require direct contact with the local community and replace them with virtual tools. In addition, NREI will enable internal communication channels for its workers and its contractors (toll-free phone, email, website and direct communication with NREI teams) to ensure access and interaction between employees, the local community and the Project when needed.

In addition, while the pandemic continues, NREI's Stakeholder Engagement activities will also be adjusted to avoid in-person events. NREI will put a special emphasis to distribute information regarding the external

grievance mechanism and other tools to disclose information, such as participating in local radio programs or distributing a monthly newsletter, for more details see the section below.

8.18.4.4 Social Actions and Community Engagement

As mentioned in Section 3.3, as a preventive measure and in order to respect the health authorities' guidelines that recommend social distancing, all activities that require direct contact with the local community will be either postponed or replaced with virtual tools. The External Grievance Mechanism and other available communication channels (toll-free phone, e-mail, website and direct communication with NREI teams) will continue to function normally. When possible, NREI will collaborate with the local authorities to contribute to the fight against the spread of COVID- 19.

In order to have a positive impact in reducing the pandemic cycle, from prevention to response, NREI plans to implement the following lines of action:

- **Disclosure of Information**: In order to prevent the spread of COVID-19, NREI will disseminate clear and accurate information and guidance documents, using simple and accessible language to reach the largest number of people;
- **Support health professionals**: Should PPE for health professionals be needed, NREI will consider contributing on this line of action as a response to the epidemic;
- **Support the most vulnerable population in the AOI**: One of the side effects of the pandemic is the economic crisis, mainly affecting the population in a situation of socioeconomic vulnerability. NREI aims to contribute with actions specifically aimed at the vulnerable groups located in the Project's AOI.

8.18.4.5 Identification of Essential Activities to begin and continue the Project

NREI aims to identify and define the services and activities essential to begin and continue the Project, considering activities of design, pre-construction and construction, and if applicable later on for the operations phase by monitoring the evolution of the pandemic, the competent authorities' guidelines, regulatory aspects, recommendations from shareholders and financiers, among others. Furthermore, attention will be given to technical criteria regarding the number of workers needed without compromising the practice of social distancing and the preservation of everybody's health and safety throughout the different activities.

8.18.4.6 Social Distancing Measures

Scientific studies have demonstrated there is a spread of expelled micro droplets, not only during sneezing or coughing, but also during human speech, capable of carrying the virus over long distances, especially in closed and poorly ventilated environments. Consequently, NREI will implement strict social distancing measures, preferably 2 meters (6 feet apart), in all activities and environments, including transportation, accommodation, cafeterias, bathrooms, meeting rooms, and workstations, in order to minimize the potential COVID-19 contagion.

Social distancing measure will also be implemented for the field and construction activities. Thus, as a good practice for the continuity of the activities considered essential during the emergency period, it is advisable that the contractors (especially EPC directly involved in the implementation of the Project) act in order to respect the 2 meters-social distancing in all their activities. Social distancing in the field and construction areas is considered critical and necessary to maintain optimal health and safety conditions at the Project during the emergency period and avoid exposure and contagion of workers. All activities in closed environments with little ventilation will be forbidden. The following specific measures will be adopted in order to implement health and safety guidelines at work:

- Maintain a safe distance (2 meters between people) in places where people work or meet regularly.
- Identify all places where people normally work within 2 meters of each other and adjust those areas to meet the safe distancing requirements, as well as establishing a regular inspection routine in offices, control rooms, meeting rooms, construction sites, work fronts. A checklist and photographic records will be completed in order to confirm adherence. In places where 2 meters of spacing cannot be reached, the possibility of expanding the workplace in previously vacant areas or placing acrylic dividers between workplaces will be evaluated.
- Increase the frequency of cleaning and spacing of sanitary appliances and offices.
- Install marks or signs on the floor, indicating safe distances, where people normally wait in lines (access to buses, turnstiles, time clock, cafeteria, on site clinic, among others).
- Expand the use of videoconferencing to replace face-to-face meetings, safety dialogues and trainings, as well as the possibility of distributing videos of HSE campaigns to workers and contractors through WhatsApp and NREI social networks.
- Establish alternate working days or extra shifts to reduce the total number of workers at any given time, allowing workers to maintain the recommended distance between them and, at the same time, ensuring the completion of work activities and comply with the construction schedule.

8.18.4.7 Activity Security Analysis and Work Permit

Based on the field activities' assessment, those considered critical and necessary to start during this emergency period will need to reinforce in the routine of such activities the need to avoid exposure of workers to social proximity less than 2 meters (whenever possible) and precautionary measures for carrying out activities in closed environments, such as places with poor ventilation. Each activity will be described in the Activity Safety Analysis and, eventually, in the Work Permit. These documents will be completed as evidence of the application of COVID-19 preventive measures at work.

8.18.4.8 Control Measures and Working Conditions

NREI will distribute surveys to identify the workers' physical and health conditions to prevent potentially ill workers from feeling under pressure to show up for work, risking the transmission of the virus to the rest of the workforce. The surveys will contain a simple checklist with information on the workers' conditions, which can be confirmed by establishing a routine inspection.

In addition, NREI and its subcontractors will ensure that their employees have access to in-person or remote medical consultation services (by phone or video call) if they encounter COVID-19 symptoms. NREI will closely collaborate with local authorities to benefit its workers and the local community.

NREI and its contractors will provide and enforce face protection masks for all people in the working areas. NREI will specify the type of mask required, the replacement frequency and will provide appropriate training. NREI and its contractors will make 70% alcohol gel available in all working areas.

8.18.4.9 Food Supply and Preparation Measures

NREI will evaluate the possibility of hiring meal delivery services from local restaurants that have already been mapped and previously contacted. NREI will also let employees bring their own meals from home if preferred.

8.18.4.10 Control Measures for Mobilizing Workers

If mobilization of workers from other communities or regions is required for the Project, both NREI and its contractors will take the following measures:

- Lists of workers and their arrivals will be reviewed at least 7 days in advance, to analyze the workers that might come from high-risk areas (areas with higher community transmission rates). These cases must be subjected to prior isolation for 15 days before starting work and access the Project area or Charlestown community.
- Monitor the list of workers, indicating the city of origin, estimated start of work and address at which the worker(s) will be kept in isolation.
- Ensure that when accessing to the Project area, all workers are wearing identification badges and essential service documentation.

NREI will observe the travel restrictions imposed by the local, national and international authorities, as well as the recommendations of the health authorities. NREI will implement the following protocols about mobilization and travel for its employees:

- All trips need to be by car, travel by plane and bus is prohibited, as a way to prevent the spread and contagion of the virus. Any exceptions to the recommendations described here will be dealt individually and aligned with the authorities' guidelines, as well as approved directly by the NREI Chief Executive Officer.
- International Corporate travel: suspension of international corporate travel. Any exceptions to the recommendations described here will be dealt on a case-by-case basis and aligned with the authorities' guidelines, as well as approved directly by the NREI Chief Executive Officer.
- Private trips: workers shall inform HR about their private trips by email and/ or phone.

8.18.4.11 Control Measures for potential Workers' Accommodations

NREI does not expect to have a significant number of workers that will need accommodation, as the Project will focus on hiring locally. Nonetheless, if a reduced number of workers need accommodation, they will be either placed in hotels or rented homes.

The following best practices will be applied in the workers' accommodations:

- Promoting, respecting and applying occupancy density limits in workers' accommodation;
- If new workers arrive from countries or areas with high COVID-19 risk, these people will have to complete a proper quarantine in accordance with local regulations and/ or recommendations of relevant international organizations;
- Whenever possible, the accommodation coordinator or the persons in charge of managing the accommodation will coordinate the daily health and safety measures of the residents, such as taking the persons' body temperature with thermometers to prevent contagion;
- Carry out the necessary measures and efforts in order to ensure that all workers have access to medical professionals, including adopting measures that remove possible language barriers, in the case of foreign workers.
- Provision of hand soap for workers in all bathrooms, as well as the adoption rigorous daily cleaning routine.

- Implement the necessary measures and efforts in order to ensure that door handles, taps, TV/ media devices, kitchen equipment, controls, buttons and any other common objects located in the areas that are touched regularly are cleaned several times a day. The cleaning frequency will be determined by each installation. Likewise, ensure that necessary measures are taken to ensure that common surfaces, including those on vehicles that transport workers from their accommodations to the workplace, counters, floors and walls, will be treated as potentially contaminated areas and therefore will be cleaned regularly.
- Keep a minimum distance of 2 meters between the beds, as well as reducing the number of people in a single room, when possible let only one person per bedroom.
- Carry out actions to maximize natural or forced ventilation within the limitations of comfort, safety and privacy, as well as considering any changes in the installation to allow ventilation during working hours.
- Mandatory use of a mask, also during off-hours. Additionally, exits that are not for the purpose of essential needs should be avoided, and it is important to have clear rules for the use of common areas in the accommodation.

8.18.4.12 Preventive Measures for Drinking Water Supply, Sanitation and Solid Waste Management

This section presents the main guidelines to prevent the contagion of COVID-19 through the drinking water supply, sanitary sewage and solid waste management services in all NREI activities and its contractors (offices, construction sites, work areas). The content was adapted from the Interim guide about Water, sanitation, hygiene, and waste management for COVID-19, published on March 19, 2020 by the World Health Organization, considering the NREI context and characteristics.

Safe Water Supply

NREI will take several measures to improve the water supply, by protecting the water source; treat water at the point of distribution, collection or consumption; and ensure that treated water is safely stored at the NREI facilities in regularly cleaned and covered containers.

For effective centralized disinfection, there must be a residual concentration of free chlorine of ≥0.5 mg / L after at least 30 minutes of contact time at pH <8.0. A chlorine residual must be maintained throughout the distribution system.

Safe Management of Waste Water and Feces Waste

Best practices to protect the health of workers in sanitation treatment facilities must be followed. Workers must wear appropriate personal protective equipment (PPE), which includes protective clothing, gloves, boots, glasses or face shield and mask; they must wash their hands frequently; and avoid touching their eyes, nose and mouth with unwashed hands.

Sanitation in on-site Clinic

The existing recommendations for sanitation in health services are important to provide adequate care and protect patients, workers and caregivers from risks of infection. The following actions are particularly important if an on-site clinic is available at the Project site:

- Managing excreta (feces and urine) safely, including ensuring that no one comes into contact with it and that it is treated and disposed properly;
- Clean and disinfect the clinic several times a day;

- Practice frequent hand hygiene using appropriate techniques and soap;
- Implementing regular cleaning and disinfection practices; and
- Safely manage health services waste.

Hand Hygiene

Hand hygiene is extremely important. Hand cleaning with soap and water or an alcohol-based hand scrubber will be carried out according to the instructions as stated in "My 5 moments for hand hygiene" (WHO, Infection prevention and control) available at https://www.who.int/infection-prevention/campaigns/clean-hands/5moments/en/.

When the hands are not visibly dirty, the preferred method is to perform hand hygiene with alcohol (rub your hands for 20 to 30 seconds using the appropriate technique). When hands are visibly dirty, they will be washed with soap and water for 40 to 60 seconds using the appropriate technique. Hand hygiene must be carried out before putting on the PPE and after removing it, when changing gloves, after any contact with a patient with suspected or confirmed COVID-19 infection or its residues, after contact with some respiratory secretion, before eating and after using the bathroom.

Functional facilities to wash the hands must be present for all workers throughout the Project site and in areas where PPE is placed or removed. These facilities must be available within 5m of bathrooms, as well as in public areas.

Cleaning Practices

The recommended cleaning and disinfection procedures must be followed consistently and correctly. Clothes will be washed and surfaces in all environments will be cleaned at least once a day. Many disinfectants are made to kill virus, such as COVID-19, including commonly used hospital disinfectants. WHO currently recommends the use of:

- 70% ethyl alcohol to disinfect small areas between uses, such as dedicated reusable equipment (for example, thermometers);
- 0.5% sodium hypochlorite (equivalent to 5000 ppm) for disinfecting surfaces.

Disposal of Dirty Water from Washing PPE, Surfaces and Floors

The WHO recommends to clean public utility gloves or heavy reusable plastic aprons with soap and water and decontaminate them with 0.5% sodium hypochlorite solution after each use. Disposable gloves (nitrile or latex) and aprons must be discarded after each use and not reused; hand hygiene will be performed after removing the PPE. If the gray water includes disinfectant used in the previous cleaning, it will not need to be chlorinated or treated again. However, it is important that this water be discharged into drains connected to a septic or sewer system or into a drainage well. If gray water is discharged into a submerged pit, the pit will be enclosed within the health facility to prevent tampering and to avoid possible exposure in the event of an overflow.

Safe Management of Health Care Waste (Project's Clinic)

Best practices for a safe management of healthcare waste will be followed at the Project's clinic, including the allocation of sufficient human and material resources and responsibilities to safely dispose of this waste.

There is no evidence that direct and unprotected human contact during the handling of healthcare waste has resulted in the transmission of the COVID-19 virus. However, all health care waste produced during

the care of patients with COVID-19 must be safely collected in designated containers and bags, treated and then safely discarded or treated, or both, preferably on site. If waste is moved out of place, it is essential to understand where and how it will be treated and destroyed. All those dealing with health care waste must wear appropriate PPE (boots, apron, long-sleeved dress, thick gloves, mask and goggles or face shield) and perform hand hygiene after removing it. For more information, see the WHO guidelines, Safe management of wastes from health-care activities: a summary, available at https://apps.who.int/iris/handle/10665 / 259491.

Sanitation and Hygiene Practices at Homes, Accommodations and Communities

Maintaining best practices for drinking water supply, sanitation, hygiene and solid waste management at home and in communities near the Project is also important to prevent the spread of COVID-19 and to care for patients at home. Regular and correct hand hygiene is of particular importance.

- Hand Hygiene:

Regular hand washing is one of the most important measures that can prevent COVID-19 infection. In homes, schools and crowded public spaces - such as markets, places of worship, train or bus stations, regular washing of hands will occur before preparing food, before and after eating, after using the bathroom or changing a child's diaper and after touching animals. Functional hand washing facilities with soap and water must be available within 5 meters of the bathroom.

- Other recommendations:

The safe management of human excreta will be considered, starting with ensuring access to regularly cleaned, accessible and functioning toilets or latrines, as well as containment, transportation, treatment and eventual disposal of sewage.

When there are suspected or confirmed cases of COVID-19 in the home environment, immediate measures will be taken to protect healthcare professionals and other family members from the risk of contact with respiratory secretions and excrement that may contain the COVID-19 virus.

Surfaces that are touched frequently throughout the patient care area will be cleaned regularly, such as next to tables, beds and other bedroom furniture. Bathrooms will be cleaned and disinfected at least once a day. Regular household soap or detergent will be used for cleaning first and then, after rinsing, a common household disinfectant containing 0.5% sodium hypochlorite (i.e. equivalent to 5000 ppm or household bleach with 1 part hydrochloride sodium to 5% water and 9 parts water) be applied. PPE will be used while cleaning, including wearing a mask, goggles, liquid-resistant apron and gloves, and hand hygiene with a hand rubbing alcohol or soap and water will be carried out after removing the PPE.

Rapid Tests to Diagnose COVID-19

Rapid antibody tests for the new coronavirus (Sars-CoV-2) can be used to support the assessment of the immune status of workers who have symptoms of COVID-19. This type of examination indicates whether or not the person had contact with the virus, through the detection of antibodies produced as a defense mechanism of the organism. According to ANVISA (http://portal.anvisa.gov.br/coronavirus), the examination is done using blood, serum or plasma samples. The method used is called immunochromatography, which is the generation of color from a chemical reaction between antigen (substance foreign to the organism) and antibody (defense element of the organism). The results obtained are called IgM and IgG. IgM and IgG are the body's defenses against an external agent, such as the virus that causes Covid-19.

NREI contractors will perform rapid tests for the diagnosis of COVID-19 following technical criteria that consider good industry practices, guidance to health agencies and specificities of each service provision

contract (e.g. location, duration, occupational risks, number mobilized workers, and need for accommodation). The following testing strategy is suggested:

- Monitoring of workers who might need testing by applying a rapid test every 15 days;
- Application of a rapid test to all non-local workers after a quarantine period of 15 days on arrival in Charlestown;

Application of a rapid test in suspected cases, from the seventh day after the onset of flu-like symptoms (fever with a body temperature above 37.6 ° C, cough, dyspnea, myalgia, upper respiratory symptoms, fatigue and more rarely, gastrointestinal symptoms). This minimum time of 7 days is necessary to ensure that there are enough antibodies in the body that can be detected by the rapid tests available on the market.

Internal Grievance Mechanism and Employment Protection

Within the measures related to the pandemic period, it is important to note the need and concern of NREI to protect its employees, their jobs and health and safety. NREI will also emphasize this to its contractors, to take the necessary care so that the employment protection measures are also applied to their employees, reducing the workers' general insecurity and concerns in the pandemic scenario.

The internal grievance mechanism will be monitored regularly in order to identify claims and concerns regarding COVID-19 or any grievance related to the pandemic circumstances.

NREI will avoid layoffs, and will only use layoffs as a last resort. NREI will adopt government measures and policies issued in the context of this public crisis to reduce employer costs, while ensuring the maintenance of jobs. NREI will maintain a constant communication with workers and their representatives to understand their demands and insecurities in order to periodically review internal contingency plans to guarantee the continuity of the Project's activities, as well as their job security.

8.18.4.13 Measures for the Office Spaces

NREI will adopt specific corporate preventive and mitigating measures at the offices in the Project and for its subcontractors, if applicable.

Preventive Measures at Work

NREI will reinforce all guidelines and recommendations for medical health and hygiene care in the work environment, especially in the corporate environment. NREI will disclose information through its communication channels, as well as constantly refilling the alcohol gel containers placed in different locations of the NREI offices and working areas for the hygiene of its employees and people who have access to NREI facilities.

More frequent cleaning will take place in areas where exposure to possible contamination is higher, such as meeting rooms, pantry, bathrooms, material/ work equipment, etc. In cases when a suspected case of contamination is reported or confirmed, a thorough cleaning process will be carried out.

NREI will take the individual body temperature using digital infrared thermometers, twice a day. If the temperature is 37.7ºC or above, preventive social isolation measures, medical assistance and monitoring will be recommended.

NREI will disclose information constantly, including Health and Safety guidelines for employees and contractors, on hygiene measures to prevent the spread and contagion of the virus, such as washing hands with soap and water or alcohol gel whenever possible, maintain preventive social isolation and avoid greeting with a hand or hug.

If a worker suffers any of the symptom associated with COVID-19 (fever, cough, difficulty breathing), the employee will be instructed to stay at home and contact the health teams available to assist employees and their families. Workers shall also inform the Human Resources team, by email and/ or telephone. The HR team shall provide the necessary support and immediate referral to medical care, whenever this is recommended by the medical evaluation. HR is responsible for gathering and controlling the employees' information related to symptoms and / or suspicious cases, as well as monitoring their situation during the duration of the contingency period.

8.18.4.14 Management of Meetings or Events

NREI and its contractors' organizers of meetings and events will be required to evaluate the need and potential risk from a COVID-19 infection due to:

- The risk of people attending the meetings or event might be unwittingly bringing the COVID-19 virus to the meeting. Others might be unknowingly exposed to COVID-19.
- While COVID-19 is a mild disease for most people, it can make others very sick and even risk their lives. Around one of every five people who are infected with COVID-19 need hospital treatment.

Key considerations to prevent or reduce COVID-19 risks in meetings or events:

BEFORE the meeting or event NREI and its contractors will:

- Double-check the authorities' advice where the meeting or event takes place. NREI and its contractors will follow the official guidance and advice.
- Develop and agree a preparedness plan to prevent infection at the meetings or events.
- Consider whether a face-to-face meeting or event is needed. Should the face-to-face meeting or event be replaceable, NREI and its contractors must choose a teleconference, videoconference or any other online mean for such meeting or event.
- Evaluate the number of people for the meeting or event is required. In case of the number of attendees could potentially be lower, the number of people will be reduced even further.
- Ensure and verify information and communication channels in advance with key partners such as public health and health care authorities.
- Pre-order sufficient supplies and materials, including tissues masks and hand sanitizer for all participants.
- Advise participants in advance that if they have any symptoms or feel unwell, they are not allowed to attend.
- Make sure all organizers, participants, caterers and visitors at the event provide contact details: mobile telephone number, email and address where they are staying. State clearly that their details will be shared with local public health authorities if any participant becomes ill with a suspected infectious disease. If they disagree with these measures, they will not be allowed at the event or meeting.
- Develop and agree a response plan before the meeting occurs, in case someone at the meeting becomes ill with symptoms of COVID-19 (dry cough, fever, malaise). This plan will include at least:
    - Identification of a room or area where someone who is feeling unwell or has symptoms can wait alone (no contact with other coworkers or meeting participants) until he/she can be safely evacuated or transferred to receive proper medical attention.

- A plan for safely transfer meeting participants with symptoms, or meeting participants that have had contact with someone who is confirmed to have the disease, to a health facility.
- NREI will make its best efforts to identify meeting participants who might have a higher risk factor or be more affected/sensitive to the disease, for instance people older than 60 years old, pregnant women, people with chronic diseases such as a cardiovascular illness, diabetes, or any other condition advised by the governmental authorities. This type of personal information will be kept as confidential and obtained based on medical records. People with this kind of conditions will not participate in meetings.
- Inform local authorities if a meeting participant, staff member or service provider appears to have COVID-19 symptoms during or just after the meeting.

DURING the meeting or event:

- The organizers will provide information or a briefing, preferably both orally and in writing, on COVID-19 and the measures that have been taken to make the event safe for participants, such as:
  - Avoid touching common surfaces.
  - Encourage regular hand washing or use of an alcohol rub by all participants at the meeting or event.
  - Encourage participants to cover their face with the bend of their elbow or a tissue if they cough or sneeze. Supply tissues and closed bins to dispose of them in.
  - Provide contact details or a health hotline number that participants can call for advice or to provide information.
  - Display dispensers of alcohol-based hand rub prominently around the venue.
- If there is space, arrange seats so that participants are at least two meters apart.
- Open windows and doors whenever possible to make sure the venue is well ventilated.

AFTER the meeting:

- Organizers will retain the names and contact details of all participants for at least one month. This will help public health authorities trace people who may have been exposed to COVID-19 if one or more participants become ill shortly after the event.
- If someone at the meeting or event was transferred to a room alone without any contact with other persons as a suspected COVID-19 case, the organizer will let all participants know this. They will be advised to monitor themselves for symptoms for 15 days and take their temperature twice a day.
- If someone develops even a mild cough or low-grade fever (i.e. a temperature of 37.3 C or more) will stay at home and self-isolate. This means avoiding close contact (2 meters or nearer) with other people, including family members. They will also call their healthcare provider to give them details of their recent travel and symptoms.
- The room where the meeting or event took place shall be cleaned and disinfected thoroughly.

8.18.4.15 Visitors

NREI will not allow visitors at the Project sites or offices for an indefinite period until the COVID-19 pandemic is resolved. Any exceptions to the recommendations described here must be dealt with on a case-by-case basis and approved directly by the NREI's Chief Executive Officer.

8.18.4.16 Remote Work (Home Office)

If possible, and to prevent the spread of the virus, NREI will enable remote work (home office) for employees that solely carry out administrative activities at the Project, in order to maintain a minimum number of employees in the office, whose activity is related to functions that cannot be performed remotely.

NREI will generally consider these three case scenarios:

1. Employees whose remote presence severely impacts the continuity of NREI's activities, with the physical presence of the employee being indispensable, even in the contingency scenario.
2. Employees whose remote presence impacts the continuity of NREI's activities, making it possible to work in the home office.
3. Employees whose remote presence has a slight impact on the continuity of NREI's activities, making it possible to work in the home office.

The assessment of remote work (home office) requests will also take into account the higher-risk groups who could suffer from more severe consequences of a possible viral contamination, such as, older employees (over 60 years old), employees with pre-existing respiratory diseases or immunodepressants, employees who live with elderly people or with family members who suffer from respiratory diseases, or immunodepressants.

The remote work options will be evaluated and resized, with the possibility of implementing a rotation system among employees allocated within each level, depending on work demands, in order to guarantee the continuity of activities and workers' safety.

NREI will provide the appropriate infrastructure for remote work, such as laptops and access to NREI’s virtual private network by employees, which shall include the company's internal systems, file sharing networks and platforms for electronic timekeeping. Employees will have support from the Project's IT services for remote access.

8.18.5 Documentation and Monitoring

The Human Resources Manager and Health and Safety Manager will be responsible for the implementation of what is stated in this plan and will keep evidence of it (e.g. checklists, COVID-19 cases at the Project, working conditions, internal grievance mechanism, workers who come from other communities, etc.).

8.18.6 Key Performance Indicators

The COVID-19 Contingency Plan is to be reviewed on a monthly basis until the pandemic is resolved in consultation with the Human Resources Manager and Health and Safety Manager. The Project will ensure that contractors update their procedures as needed.

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-52: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Health and Safety Conditions at Work	Availability of preventive COVID-19 material (cleaning products, disinfectant, masks, gloves, alcohol gel, etc.)	All Project areas shall have cleaning materials and available PPE at all times.	Until the pandemic is resolved.	Human Resources, Internal Grievance Mechanism and Health and Safety Manager / Daily
	Hand hygiene facilities	One sink available to wash the hands per 20 workers. Alcohol gel available in all Project areas at all times.	Until the pandemic is resolved.	
	Clinic at the Project Site	100% reported COVID-19 cases and symptoms. Clinic shall be cleaned and disinfected daily, after each worker's visit.	Until the pandemic is resolved.	
	Internal Grievance Mechanism	100% reported, evaluated and solved grievances regarding COVID-19 claims or concerns	Until the pandemic is resolved.	

8.19 Chance Find Plan (Exploration and Exploitation Phases)

8.19.1 Introduction

This Chance Find Procedure complies with Saint Kitts and Nevis laws and ESIA commitments and aligns with international standards for the protection of cultural heritage. It includes a Cultural Heritage Monitoring Program, Chance Find Plan, Cultural Heritage Training Program, and Site Protection Program, as detailed in the sections below.

8.19.1.1 Objective

This Chance Find Plan has the following objectives:

- To protect known cultural heritage from Project-related impacts; and
- To properly identify and mitigate impacts to cultural heritage inadvertently discovered during ground-disturbing construction activities (i.e., chance finds).

8.19.1.2 Scope of Application

This Chance Find Procedure applies to all Project activities that involve ground-disturbing activities.

8.19.2 Roles and Responsibilities

The Table below presents the roles and responsibilities for the implementation of this Chance Find Procedure.

Table 8-53: Roles and Responsibilities

Role	Responsibilities
ESG Manager	■ Implementation of the Cultural Heritage Monitoring Program, including contracting an on-call Cultural Heritage Specialist. ■ Implementation of the Chance Find Procedure, including notification of chance finds to relevant governmental authorities and cultural heritage stakeholders. ■ Implementation of the Cultural Heritage Training Program, including ensuring that workers involved in ground-disturbing activities are properly trained in the identification of chance finds and implementation of the Chance Find Procedure. ■ Implementation of the Site Protection Program, including ensuring that the Hamilton Estates sugar work ruins are properly marked with flagging tape and signs throughout the construction phase.
Cultural Heritage Specialist (On call)	■ Evaluation of potential chance finds. ■ Development of chance find treatment plans in consultation with governmental authorities and cultural heritage stakeholders. ■ Implementation of chance find treatment plans.

Role	Responsibilities
	■ Reporting on the results of chance find evaluations and on the implementation of chance find treatment plans.

Source: NREI, 2020

8.19.3 Regulatory Background

8.19.3.1 National Regulations

The objective of the National Conservation and Environment Protection Act of 1987 is to "provide for the better management and development of the natural and historic resources of Saint Christopher and Nevis for purposes of conservation; the establishment of national parks, historic and archaeological sites and other protected areas of natural or cultural importance including the Brimstone Hill Fortress National Park; the establishment of a Conservation Commission; and for other matters connected thereto." The act defines a historic site as "a place or site which is historic by reason of an association with the past and is part of the cultural and historical heritage of Saint Christopher and Nevis, and such a classification may include archaeological sites, historic landmarks, and areas of special historic or cultural interest." Part II, Section 3 of the act allows the Minister (defined as "the Minister for the time being charged with the subject of Development"), in consultation with the Conservation Commission, to designate Protected Areas, including historic sites. Part III, Section 8 states that the Conservation Commission shall include the "President or his representative of the Nevis Historical and Conservation Society." Section 9 states that Protected Areas are to be held in trust by the Conservation Commission. Part IV establishes the Brimstone Hill Fortress as a National Park, and Part V recognizes Bath Hotel as a historic site. Part IX (Antiquities and Historic Buildings), Section 48 states that the excavation of archaeological sites must be done under a permit issued by the Minister, and Section 50 states that the Minister must be notified in the event of the inadvertent discovery of archaeological remains.

8.19.3.2 International Standards

The principal international standard for the protection of cultural heritage is Performance Standard (PS) 8 (Cultural Heritage) of the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012). The objective of PS 8 is to "protect cultural heritage from the adverse impacts of project activities and support its preservation… [and] promote the equitable sharing of benefits from the use of cultural heritage." PS 8 defines cultural heritage as:

- Tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values;
- Unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and
- Certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

PS 8 differentiates between replicable, non-replicable, and critical cultural heritage, which are defined as follows:

- Replicable Cultural Heritage: Defined as "tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may

be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures."

- Non-replicable Cultural Heritage: Includes "(i) cultural heritage [that] is unique or relatively unique for the period it represents; or (ii) cultural heritage [that] is unique or relatively unique in linking several periods in the same site."
- Critical Cultural Heritage: Includes "(i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation."

The preferred mitigation measure for all cultural heritage impacts is avoidance. When this is not possible, PS 8 provides the following mitigation hierarchy (from preferred to least preferred) for replicable cultural heritage:

- Minimize adverse effects and implement in situ restoration measures;
- Restore the functionality of the cultural heritage in a different location;
- Permanent removal of historical and archaeological artifacts following national laws and internationally recognized practices by competent professionals; and
- Compensation for the loss of cultural heritage.

The removal of non-replicable cultural heritage will only take place if there is no technically or financially feasible alternative and the benefits of the project outweigh any heritage losses. The removal of critical cultural heritage will only take place in "exceptional circumstances" and after extensive consultation with affected communities and other stakeholders.

PS 8 also requires the development and implementation of chance find procedures. Chance finds are defined as "tangible cultural heritage encountered unexpectedly during project construction or operation," and a Chance Find Procedure is defined as "a project-specific procedure that outlines the actions to be taken if previously unknown cultural heritage is encountered." The requirement is a recognition of the fact that no survey, regardless of methodology, is sufficient to ensure that all archaeological resources are identified in a project area, and that there is therefore always the potential for the inadvertent discovery of cultural heritage during ground-disturbing construction or operational activities.

According to the IFC Guidance Note 8, the Chance Find Procedure will "include record keeping and expert verification procedures, chain of custody instructions for movable finds, and clear criteria for potential temporary work stoppages that could be required for rapid disposition of issues related to the finds. It is important that this procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority, as well as any agreed consultation procedures. The procedure will be incorporated into the Management Program and implemented through the client's Environmental and Social Management System."

8.19.4 Baseline Conditions

There are no known prehistoric archaeological sites (Wilson 2006) and no currently listed historic sites or landmarks in the Project Area (https://nevisisland.com/nevis-history/historical-sites-landmarks). There is a known, non-listed historic site adjacent to the Project Area, however, which is the sugar works ruins at the Hamilton Estate Plantation.

The Hamilton Estate Plantation is named after Andrew Hamilton, who purchased the land in 1772. Although there is no established connection between Andrew Hamilton and Alexander Hamilton (Point Impact Analysis 2017:59-60), the estate is generally believed to have been owned by the latter's family (e.g., https://www.smithsonianmag.com/travel/alexander-hamilton-nevis-caribbean-island-180964047/). The

estate was 552 acres when purchased by Andrew Hamilton, but he later added land to it, bringing its total to 580 acres. The lands were worked as a sugar plantation from Andrew Hamilton's time into the 20th century. In 1900, there were still 10 steam mills and 6 windmill in operation on the estate, but by 1921 there were only 3,000 acres of land under sugar cultivation. The colonial government purchased the estate in 1933, and sugar production ceased in 1951 (Point Impact Analysis 2017:59-60). The location of the Hamilton Estate Plantation is depicted on a historic 1871 map of Nevis by Edward Stanford (Figure 5.2-2).

The Hamilton Estate is mentioned as a tourist destination on several tourism websites, and there is a Nevis Heritage Trail sign at the sugar work ruins advertising it as "one of the most complete plantation factories in the Caribbean" and "one of the last remaining inland sugar factories in Nevis" (e.g., https://angieaway.com/2019/03/19/nevis-travel-guide/).

The sugar work ruins at the Hamilton Estate are located south of Estate Road on Hamilton Heritage Trust land, opposite the proposed site of the injection well. The historic ruins are located approximately 25 meters from the nearest portion of the proposed injection well site.

8.19.5 Cultural Heritage Monitoring Program

NREI will implement a Cultural Heritage Monitoring Program for all construction activities in consultation with the Minister and other cultural heritage stakeholders (e.g., the Nevis Historical and Conservation Society), as appropriate. The purpose of this monitoring is to:

- Identify, record, and protect cultural heritage that has not been previously identified (i.e., chance finds); and
- Protect cultural heritage identified during previous cultural heritage investigations (i.e., known resources).

The program will utilize "passive" cultural heritage monitoring. Passive monitoring means that there will be no Cultural Heritage Specialist on site during construction. Instead, all Project and contractor personnel are responsible for cultural heritage monitoring during their daily activities. Relevant Project and contractor staff will receive training in the identification of potential chance finds and the Chance Find Procedure described below, and will be responsible for reporting any potential chance finds to the ESG Manager. The ESG Manager will then report the potential chance finds to a CHS to be retained by the Project (i.e., on call).

8.19.6 Chance Find Procedure

The following types of cultural heritage are the most likely to be encountered during construction:

- Pre-Columbian archaeological features (e.g., habitations, hearths, burials);
- Pre-Columbian artifacts (e.g., ceramic sherds, stone tools);
- Historic archaeological features (e.g., brick wells and foundations); and
- Historic artifacts (e.g., clay pipes, bottle fragments and coins).

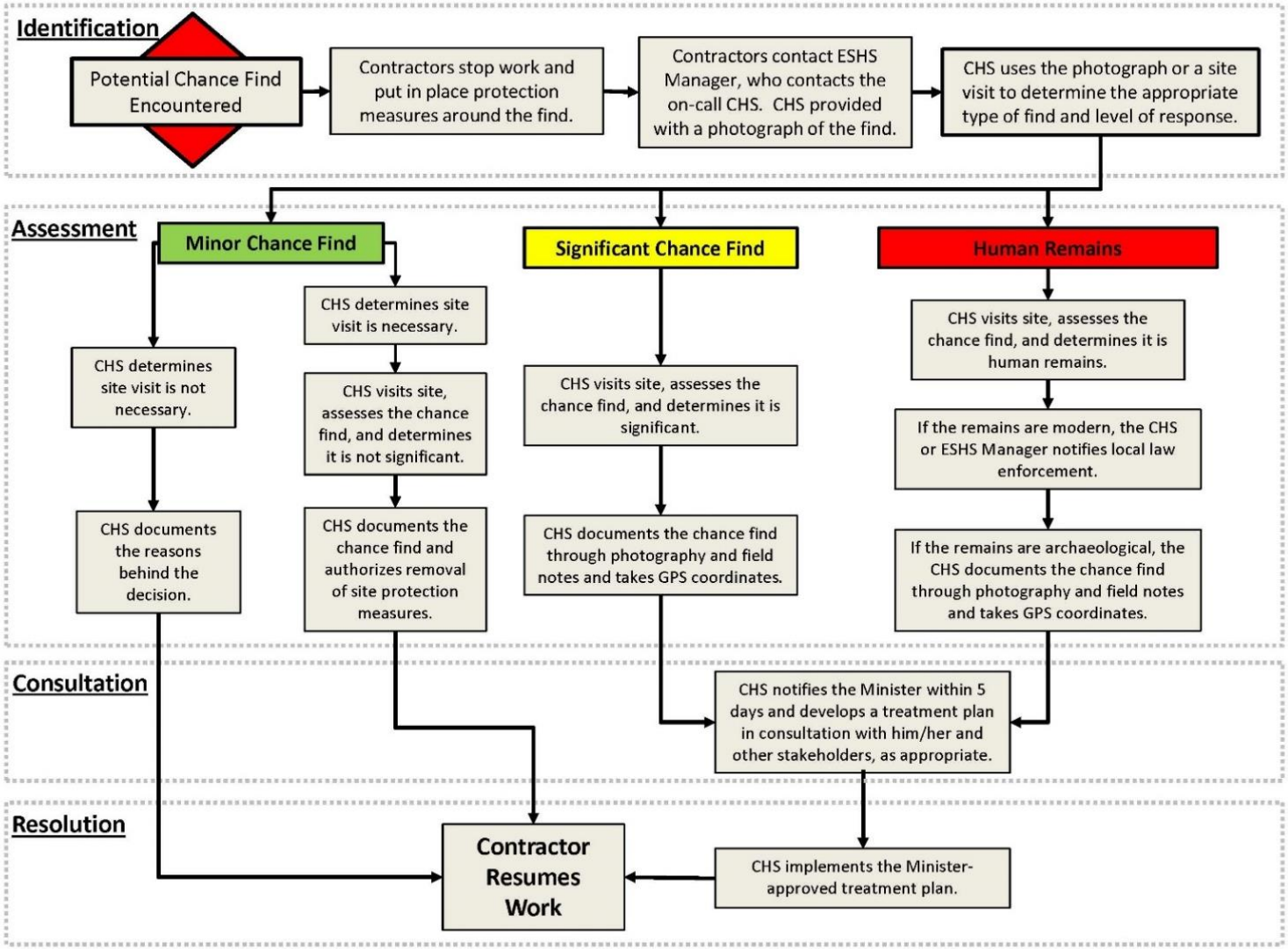
The Chance Find Procedure will use a multi-tiered approach for identifying, assessing, and resolving potential chance finds. The purpose of this approach is to empower the Cultural Heritage Specialist to resolve minor chance finds without requiring consultations with the Minister and minimize construction delays by allowing for the quick resolution of non-significant finds by the Cultural Heritage Specialist in the field. The defining characteristics of each chance find tier and the processes for assessing them and determining if consultation is required will be developed in consultation with the Minister and other cultural heritage stakeholders, as appropriate. A preliminary three-tiered chance finds hierarchy is presented in Table 2. All potential chance finds identified by Project personnel will be reported to the ESG Manager, who will then notify an on-call Cultural Heritage Specialist. The Cultural Heritage Specialist will determine if the

potential find is a chance find and assign it to a chance finds tier. Figure 1 provides a flowchart of the Chance Find Procedure.

Table 8-54: Three-tier Chance Find Hierarchy

Chance Find Type	Characteristics	Evaluation Process
Minor Chance Finds	Modern features or objects. Isolated historic or prehistoric artifacts that are out of context or lack research potential or value.	Construction work will stop in the area of the find. The potential find will be reported to the ESG Manager, who will then notify the on-call Cultural Heritage Specialist, within 24 hours. The Cultural Heritage Specialist will then examine the potential find via photographs or a site visit. If the find is determined to represent a minor chance find, the find will be documented and collected/resolved in the field by the Cultural Heritage Specialist without Minister consultation. Construction activities will then resume in the area.
Significant Chance Finds	Significant historic or prehistoric features or artifacts.	Construction work will stop in the area of the find. The potential find will be reported to the ESG Manager, who will then notify the on-call Cultural Heritage Specialist, within 24 hours. The Cultural Heritage Specialist will then conduct a site visit to examine the potential find. If the find is determined to represent a significant chance find, the Cultural Heritage Specialist will notify the Minister within five days. The Cultural Heritage Specialist will develop a treatment plan in consultation with the Minister. Construction activities will resume in the area upon completion of the Minister-approved treatment plan.
Human Remains	Modern, historic, or prehistoric burials, isolated human remains, and/or associated features and/or artifacts (i.e., grave goods).	Construction work will stop in the area of the find. The potential find will be reported to the ESG Manager, who will then notify the on-call Cultural Heritage Specialist, within 24 hours. The Cultural Heritage Specialist will then conduct a site visit to examine the potential find. If the find is determined to represent modern human remains, the Cultural Heritage Specialist or ESG Manager will notify local, regional, or national law enforcement agencies. If the find is determined to represent archaeological human remains and/or burial goods, the Cultural Heritage Specialist will report the find to the Minister within five days. The Cultural Heritage Specialist will develop a treatment plan in consultation with the Minister and other stakeholders (e.g., potential descendent communities), as appropriate. Construction activities will resume in the area upon investigation and removal of the remains by law enforcement (modern) or completion of the Minister-approved treatment plan (archaeological).

Source: NREI, 2020.



*CHS = Cultural Heritage Specialist

Figure 8-10: Chance Find Procedure Flowchart

Artifacts collected in connection with chance finds will be minimized. Photos of artifacts with a scale included in the frame will be taken as soon as possible. Artifacts and associated notes and photographs taken by any Project personnel will be given to the Cultural Heritage Specialist. Details of how artifacts will be collected and stored and what notes and photographs will be taken at the time of discovery will be provided in the Cultural Heritage Training. Artifacts found belong to the government of Saint Kitts and Nevis, and the Cultural Heritage Specialist will be responsible for giving them to the Minister.

The Cultural Heritage Specialist and the ESG Manager will maintain records on chance finds and the implementation of treatment plans. These will include:

- Monthly reports summarizing reporting period activities, including chance finds identified, the results of any chance find assessments, internal and external communications and instructions, and supporting photographic documentation (or other reference materials as appropriate); and
- Any additional reports prepared to fulfil specific requirements of the Minister.

8.19.7 Cultural Heritage Training Program

Relevant Project personnel will receive training and demonstrate competency in the identification of chance finds and the Chance Find Procedure described above. This training will be incorporated into the overall induction process for Project and contractor personnel, and will include a quick reference handout. The ESG Manager will maintain records of all Cultural Heritage Training provided to Project personnel.

All employees must be aware that it is illegal and forbidden to disturb or remove cultural heritage objects offsite for personal gain. To support the training process, the Project will develop training materials for use in the overall induction process.

8.19.8 Site Protection Program

Known cultural heritage sites will be protected from Project-related damage. This includes sites identified in advance of construction activities (i.e., the Hamilton Estate sugar work ruins) and those found during construction (i.e., chance finds). Sites may be located in Project areas or adjacent to them. In some cases, it may be necessary to modify construction techniques to protect sites in work areas. Site information will be provided to Project personnel in written and verbal form in official transmittals, meetings, and toolbox talks as appropriate to ensure that known cultural heritage sites are protected.

The following procedures will be followed for protecting archaeological resources located within the Project area (i.e., significant chance finds), when required by the Minister, and for known archaeological sites located adjacent to or near ground-disturbing construction activities:

- The perimeter of the archaeological resource or site will be marked with high-visibility caution tape;
- Signs will be posted that the marked area is a protected archaeological site and that entry with mechanized vehicles is prohibited; and
- When ground-disturbing activities in the area are concluded, the caution tape and sign will be removed.

8.19.9 Key Performance Indicators

Table 3 presents the key performance indicators that will evaluate the implementation of this Chance Find Plan.

Table 8-55: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Disturbance of Archaeological Remains	Number of chance finds encountered, evaluated, and treated	100% evaluation of potential chance finds 100% treatment of significant chance finds and archaeological human remains	Construction	Quarterly Reports
	Cultural Heritage Training of workers involved in ground-disturbing construction activities	100% of workers trained	Construction	Quarterly Reports
	Protection of known cultural heritage sites from construction activities	No damage to the Hamilton Estate sugar work ruins	Construction	Quarterly Reports

8.20 Transportation Management Plan (Exploration and Exploitation Phases)

8.20.1 Introduction

Nevis Renewable Energy International, INC (NREI) (hereafter the Project) is committed to implementation of the Environmental and Social Management Plan (ESMP) policies and procedures. This Transportation Management Plan establishes measures to minimize the effects of the Project's construction and operations on traffic, road infrastructure, and accident risk within the Area of Influence. This Plan focuses on the prevention or reduction of impacts and describes management measures, monitoring and reporting processes, Key Performance Indicators (KPIs), and responsibilities for implementation of the Plan.

8.20.1.1 Objectives

The objectives of this plan are to manage and reduce Project-related risks and minimize potential impacts resulting from Project-related traffic. The impact assessment for the Project identified transportation-related risks in terms of traffic congestion, safety for motorists, pedestrians and bicyclists, and degradation of road facilities, particularly during the Construction phase, and to a more limited extent during the Operations phase. This Plan presents strategies and measures to mitigate potential safety risks and transportation facility impacts for affected populations and areas.

The measures established in this plan are intended to:

- Provide a safe environment for drivers, passengers, pedestrians, workers, communities and fauna of the Area of Influence;
- Establish guidelines regarding route planning and site access;
- Identify preventive measures to avoid and minimize traffic accidents and disturbances to nearby communities;
- Minimize road infrastructure degradation; and
- Address transportation-related noise, vibration, and dust

8.20.1.2 Scope of Plan

This Management Plan applies to transportation of Project-related goods, services and personnel on publicly accessible roads during Project construction and operations. The geographical scope is the Project Area of Influence, which comprises two parts:

- The Area of Direct Influence (ADI, Section 5.1.2 of the ESIA), which includes the area occupied by the Project footprint (Project parcel, transmission line routes, substation); the Long Point Port, which the Project will use for cargo; the transportation routes from the port to the Project; and the city of Charlestown, where Project traffic will have an influence.
- The Area of Indirect Influence (AII), which includes other areas where the Project could generate traffic. Due to the limited nature of roads on Nevis, the entire island of Nevis is the AII.

8.20.2 Roles and Responsibilities

It is NREI's responsibility to ensure that employees, contractors and subcontractors implement the Environmental and Social Management Plan (ESMP) policies and procedures, which are aligned to international requirements and best practices. Contractors will implement the practices established in this transportation management plan, and will establish detailed procedures to apply the management practices on the ground. NREI will review and approve this document before implementation.

In order to properly implement the Transportation Management Plan, NREI requires the involvement of the people listed below.

Table 8-56: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiar with, review and approve the Transportation Management Plan.
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Transportation Management Plan.
Project Manager	■ Be familiar with, review, and update as necessary the Transportation Management Plan.
ESG Manager	■ Assure the correct implementation of the Transportation Management Plan. ■ Review and approve each contractor's Project-specific Transportation Management Plan.
H&S Manager	■ Ensure the generation of evidence and reports for compliance with the IFC PS and the KPIs established in this plan. ■ Verify implementation of the Transportation Management Plan.
Employees, contractors and subcontractors	■ Understand and carry out the procedures and activities required by this Transportation Management Plan.

Source: NREI, 2020

8.20.3 Activities

Traffic impacts will result from several types of Project-related activity, primarily during the construction period:

- Worker commuting. An estimated 120 workers will be employed during peak construction periods (NREI 2020b). The Project plans to provide buses for some workers to reduce traffic congestion (Thermal Partners 2019). NREI estimates employment during operations at 17 employees on site per shift, for two shifts.
- Delivery of equipment, components, materials and supplies. Most deliveries are anticipated to come from Long Point Port. Supplemental water will be delivered from a tank farm near Charlestown, and other deliveries may come from local suppliers in Charlestown or other locations on Nevis.
- Transmission conduit installation along local roads between the new geothermal plant and the existing power plant.

During operations, the Project will generate a small volume of road traffic from worker commuting, deliveries, waste disposal and maintenance or repair needs.

8.20.4 Transportation Management Measures

The following sections describe measures to manage traffic, prevent degradation of road infrastructure, and mitigate safety risks related to project-generated traffic within the Area of Influence.

8.20.4.1 Key Traffic Impacts

Traffic impacts to the community will occur primarily during Project construction and include:

- Increased traffic from worker commuting and truck deliveries, resulting in potential for road congestion or delays during times of peak traffic volumes.
- Increased risk of vehicle collisions resulting in property damage, injury or mortality, including risk to pedestrians and bicyclists.
- Increased deterioration of road infrastructure.
- Dust and sediment transport from traffic leaving the Project site.
- Sensory disturbance resulting from the noise and vibration generated by vehicles

Prior to the start of construction, all NREI projects must identify: (1) transportation safety risks and potential impacts; and (2) the receptors, within the Project´s specific context and Area of Influence. Once these are identified, mitigation measures for each risk and impact will be proposed, implemented and monitored.

8.20.4.2 Traffic Management

The Project shall adopt and implement the following best practices to address the traffic and transport impacts described in Section 4.1.

Driver Safety Measures

The following measures address road safety risks related to driver competency, driver behavior, and vehicle operation.

- Implement driver safety programs to provide initial training and periodic reviews for all drivers in correct operation of trucks, buses or equipment. Include potential consequences of excessive speed and overloading, traffic laws, and road safety. Include training in defensive driving, use of vehicle safety systems, and appropriate precautions in adverse conditions such as fog or rain. Keep records of training for each driver.
- Provide training specific to particular travel routes, with emphasis on measures to protect pedestrians and bicyclists.
- Require drivers and operators to have appropriate licenses, insurance, and training specific to the vehicle or equipment that they will drive or operate.
- Establish maximum driving shift lengths and minimum rest times to avoid fatigue.
- Prohibit cell phone use while driving.
- Mandate compliance with all traffic signals and regulations.
- Require that all persons seated in the cabs of vehicles and bus operators use seatbelts while the vehicle is in motion. All passengers must be seated safely; riding on equipment or other non-passenger vehicles is prohibited.
- Establish random and/or for-cause drug and alcohol testing, consistent with applicable laws.

- Use vehicle speed monitoring or speed governors to ensure that vehicle operators comply with posted speed limits or (in the absence of posted limits) safe speed limits on public roads.
- Provide a Code of Conduct that drivers must sign, establishing standards and disciplinary measures for noncompliance. The Code will include the aforementioned driver safety measures.
- Provide and enforce a Journey Management Plan for truck deliveries that includes compliance with speed limits, safe driving practices, required use of escort vehicles for movements of cargo containers or other large equipment, and understanding of vehicle handling, community impact and response to spills or incidents. During operations, make continued use of Journey Management Plans for truck deliveries.

Vehicle Integrity

The following measures address road safety risks related to vehicle condition.

- Require scheduled preventative inspection and maintenance of vehicles and use of parts approved by the manufacturer, to reduce the risk of accident due to vehicle malfunction or premature failure.
- Implement mandatory training in and completion of a daily safety checklist prior to the movement of each vehicle onto the public road system, as well as a separate checklist for on-site vehicles and equipment.
- Immediately withdraw vehicles from service upon detection of defects; repair or replace vehicles as necessary.
- Keep a record of inspections, maintenance and repair for each vehicle.

Route Management

The following measures address traffic congestion and road safety risks related to route planning and management.

- Plan routes and timing of deliveries to minimize the interaction of pedestrians with delivery and construction vehicles.
- Collaborate with surrounding communities and relevant authorities to improve signage, visibility and general road safety, especially near schools or other places where there may be children.
- Organize worker bus service to reduce external traffic.
- Use traffic safety control measures, including road signs and flag personnel, to warn of and direct traffic around dangerous conditions.
- Minimize truck deliveries during morning and afternoon peak hours, as determined in accordance with Nevis traffic authorities. Use traffic control vehicles and notify public concerning details of schedule and potential impediments to travel.
- For oversized vehicles, coordinate with local authorities, use escort vehicles, and provide advance notification to community leaders and representatives concerning details of schedule and potential impediments to travel.
- Minimize truck trips on public roads through scheduling and development of efficient vehicle manifests.

Road Condition

The following measures address road condition, maintenance and repair.

- Provide traffic controls (flaggers) where conduit installation temporarily reduces road width. Clearly mark temporary detours, if needed.
- Coordinate in timely manner with local governmental authorities regarding condition and needed repairs to public roads. Notify authorities of road deterioration (cracks, potholes, damaged shoulders).
- Transport tracked vehicles on a truck rather than directly on the public road.
- Once construction is completed, coordinate with authorities and provide or contribute to repairs to roads used for deliveries, especially along the route from Long Point Port to the Project site.

Noise, Vibration and Dust

The following measures help to address the impact on communities from noise, vibration and dust from Project-related vehicles travelling on public roads.

- As needed, wash vehicles leaving the Project site to avoid carrying dirt and dust from the site onto the public road.
- Securely cover loads on trucks to minimize spillage and dust.
- Do not overload trucks.
- Require that truck noise-controlling devices be in good operating condition.
- Avoid nighttime truck trips on roads that pass through residential areas.

Transportation safety within project site

The following measures address transportation safety within the project site.

- Implement signage and signaling on the Project site with high visibility elements to identify site access points, circulation routes, loading/unloading areas, and parking areas. Separate internal truck routes and loading/unloading areas from circulation and parking areas for workers commuting to the site.
- Also identify the following on-site features with signage or signaling:
  - Speed limits;
  - Pedestrian crossings (e.g. crosswalks, pedestrian paths);
  - Indications of direction of movement, prohibition of passage, stops;
  - Areas with prohibition on parking or stopping;
  - Emergency routes and exits;
  - Project locations (e.g. offices, other facilities, medical services, etc.); and
  - Waiting area when accessing the Project.
- Restrict Project site access to authorized vehicles.

Communication with Community Stakeholders

The Stakeholder Engagement and Communication Plan and External Grievance Procedures will include opportunity and procedures for communication between the Project and community stakeholders. The communication must include information and opportunity for participation by the community in discussion of Project impacts related to traffic. Stakeholder communication will include the following provisions:

- Establish and enhance relationships with local stakeholders to gain understanding of risks particular to the proposed haul route from Long Point Port to the Project site, such as locations with higher crash

incidence, risk factors, pedestrian and bicycle traffic patterns, and community events that may lead to traffic congestion (i.e., holidays or special events).

- Use the Stakeholder Engagement and Communication Plan as a mechanism for initial and ongoing communication with stakeholders, such as road users and community residents, about traffic issues and anticipated routes/volumes of truck traffic.
- Use the External Grievance Procedures to allow community residents and road users to report grievances related to Project traffic.
- Provide community education programs on road safety and vehicle interactions. Increase road safety awareness for pedestrians, school children and other community members.

8.20.4.3 Documentation and Monitoring

Digital (including native and scanned files, as well as photography where appropriate) and written records of the Traffic Management Plan implementation will include the following records:

- Driver records:
  - Contractual requirements;
  - Registry of driver's licenses;
  - Records of driver training, testing, and adherence to Code of Conduct; and
  - Records of driver incidents or violations of policies, such as speed limits, other moving violations, drug or alcohol use, or other violations.
- Vehicle records:
  - Registry of the vehicles used, as well as evidence of their tenure payment and verification;
  - Registry of vehicles insurance policies;
  - Logbook of vehicle inspections; and
  - Maintenance and repair records.
- Traffic management records:
  - Vehicle manifests;
  - Record of travel plans for convoys and oversized loads;
  - Registry of notifications to affected communities of anticipated Project-related traffic;
  - Transport plan that identifies peak traffic periods and truck delivery schedule to identify timeframes for road transport that avoid times of peak pedestrian or road traffic volumes and nighttime travel through residential areas; and
  - Authorization of relevant authorities for occupation of public roads or for works on public roads;
- Road condition records:
  - Records of road maintenance/repair needs reported by the Project to government authorities;
  - Pre-construction road survey and action plan, and post-construction update of road conditions; and
  - Records of any contracts or agreements regarding cost-sharing between Project and local authorities for road maintenance and repairs.

- Stakeholder engagement records:
  - Record of communications with public authorities and community leaders;
  - Record of public education events, publications and meetings, including attendees and comments received; and
  - Record of road traffic-related grievances and resolution.
- Incident reports:
  - Records of breakdowns or collisions, including investigations and outcomes.

8.20.4.4 Key Performance Indicators

The Community Health and Safety Management Plan is to be reviewed on a six-month basis for the initial two years and then annually or as necessary in consultation with key stakeholders. The KPIs shown below will be useful to determine if the Transportation Management Plan has been effectively implemented. Based on the level of compliance with indicators, the Project can identify if changes are necessary and can consider improvement measures.

Table 8-57: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
Road Congestion	Number of complaints received through the Complaint Management Mechanism for Communities related to traffic management and road congestion.	100% grievances addressed and solved in a timely manner related to road traffic congestion	Primarily construction but continue during operations	External Grievance Mechanism database log / Quarterly
	Number of interactions with authorities and communities for consultation and disclosure.	Frequent (at least monthly) interactions with communities during construction; interactions with authorities as needed.	Construction	Stakeholder Engagement and Communication Plan; record of permits and authorizations from government / Quarterly
Risk of collision	Completion of analysis to identify locations along truck delivery routes with greater risk of collisions or conflict with pedestrian/bicycle travel; establish safety protocols	Analysis completed, with opportunity for community input and subsequent revision, prior to construction	Completed prior to Construction	Analysis completed by EHS Coordinator; refined through Stakeholder Engagement and Communication Plan / Once
	Number of minor accidents involving Project vehicles along the access roads (i.e., no injuries, minor property damage)	Zero incidents	Construction and operations	Accident and Incident Recording, Reporting and Investigation System / Monthly
	Number of major accidents involving Project vehicles along the access roads (i.e., personal injuries requiring	Zero incidents	Construction and operations	Accident and Incident Recording, Reporting and Investigation System

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool / Frequency
	medical attention, major property damage)			
	Number of complaints received through the Complaint Management Mechanism for Communities related to traffic safety and driver performance.	100% grievances addressed and solved in a timely manner related to road traffic congestion	Primarily construction but continue during operations	External Grievance Mechanism database log
	Driver training	100% of NREI workers, contractors and subcontractors have required licenses and receive driver training	Construction and operations	Driver records
	Driver compliance	100% of NREI workers, contractors and subcontractors comply with Driver Code of Conduct	Construction and operations	Driver records
	Community education and awareness	One training for community members focused on road safety along delivery routes to the Project, at least 15 days before construction begins and repeated every three months during construction. Printed copies of information on road safety available at public buildings at all times	Construction	Stakeholder Engagement and Communication Plan
Road wear and deterioration	Survey of road conditions along primary delivery routes and along roads where conduits will be installed	Visual (windshield) survey with documentation (photographs) completed prior to construction; at least once every three months during construction; upon completion of construction	Construction	Survey completed by NREI and submitted to appropriate governmental authority
	Number of vehicle trips, including truck trips.	Record of Project-related truck trips during construction	Construction	Community Relations Coordinator
Noise, vibration, dust	Vehicle inspection, maintenance and repair lots	Maintenance of vehicle noise-reducing devices as needed.	Construction	Vehicle logs
	Vehicle manifests	All vehicles loaded and tarped in compliance with capacity	Construction	Vehicle logs
	Number of complaints received through the Complaint Management Mechanism for Communities related to noise, vibration or dust.	100% grievances addressed and solved in a timely manner related to road traffic congestion	Primarily construction but continue during operations	External Grievance Mechanism database log

8.20.4.5 Review and Update

The Project ESG Manager will update the Traffic Management Plan annually, or when a significant change or event occurs.

8.21 Training Plan (Exploration and Exploitation Phases)

8.21.1 Introduction

Nevis Renewable Energy International, Inc. (NREI) is committed to ensure the compliance of the implementation of the Environmental and Social Management Plan policies and procedures.

To promote the Project's alignment to best international practices, NREI acknowledges that all personnel involved in the project, during both the construction and operation phases of the project, must be trained in order to ensure compliance with all of the requirements of the ESMP. This Training Plan compiles all of the training requirements detailed throughout the individual management plans specifically developed for all workers, including contractors and subcontractors.

8.21.1.1 Objective

The objective of this plan is to provide a quick reference guide which compiles all of the training requirements detailed throughout the individual Project's ESMP. The purpose of the required training is to ensure all Project personnel and their contractors are trained in all health, safety, environmental, social and Emergency Response procedures and requirements. All contractors, including their workers, will be responsible for complying with this Plan, as well as executing the works in accordance with current environmental and safety regulations. The specific objectives of the training requirements in the ESMP are:

- To be aware of the legal framework;
- To become familiar with International Standards, such as the IFC Performance Standards, and any other standards pertaining to the Project;
- To know the relevant aspects of environmental and social management in all Project activities and promote their implementation;
- To train technical personnel in relation to threats, possible risk situations, in order to adopt strategies to reduce the effects on the different processes, communities and resources in the area of influence; including potential accidents associated with the construction, operation and maintenance of the Project components;
- Train staff on environmental issues including the concept of non-hazardous and hazardous waste management including the implementation of the five (5) "Rs" (reuse, recycle, reduce, repair, reject) where appropriate, water conservation, and wildlife protection;
- Encourage an environmental culture in all Project workers, including staff sensitization on the importance of environmental sustainability;
- Train staff on social issues that include, for example, gender aspects, grievance mechanisms, workers' code of conduct, among others; and
- Train staff on health and safety matters.

8.21.1.2 Scope of Application

These procedures shall apply during the development of NREI's activities and during the Project's life cycle (construction, operations and decommissioning). It is NREI's responsibility to ensure that employees, contractors and subcontractors are evaluated according to ESMS policies and procedures, which are aligned to international best practices.

This Training Plan provides training requirements related to all Project activities. This plan shall be distributed to all contractors / subcontractors, and it shall be included in all contractual documentation and used as a basis for all specific training of engaged parties. Contractors will use this plan and develop their specific training protocols to meet the various requirements of the Project's ESMP and how they will be applied on the ground. NREI will review and approve these document before any implementation.

8.21.2 Roles and Responsibilities

In order to properly implement the Training Plan, NREI requires the involvement of the people listed below.

Table 8-58: Roles and Responsibilities

Role	Responsibilities
CEO	■ Be familiarized, review and approve the Training Plan
Head of Finance	■ Ensure the availability of resources necessary for the implementation of the Training Plan
Head of ESG	■ Assure the correct implementation of the Training Plan
ESG Manager	■ Assure the correct implementation of the Training Plan ■ Update the Training Plan ■ Review and approve the contractor project-specific Training protocols and/or plans
Environmental Coordinator or H&S Supervisor	■ Ensure the generation of evidence and reports for compliance with the IFC PS as well as maintaining NREI's KPIs. In addition, ensure the internal coordination to follow the Training Plan
Contractor Company	■ Develop a project-specific Training Plan or training protocols
Employees, Contractors and Subcontractors	■ Understand and carry out the activities set out in the Training Plan

Source: NREI, 2020

8.21.3 Required Training Activities

The following table presents the different types of training required by topic, their frequency and the required personnel for both the construction and the operational phases of the Project.

Table 8-59: Required Training Activities by Topic

Topic	Project Phase	Required Training	Personnel Required	Frequency of Training
Biodiversity Management	Construction and Operation	Workers Health and Safety: ■ Training and induction on the importance of biodiversity in the region, including:		Induction training/yearly refreshers

Topic	Project Phase	Required Training	Personnel Required	Frequency of Training
		- Restrictions and prohibitions on harassment, hunting, trapping, gathering, buying, and/or selling of flora and fauna species (included contractors); - Information on species present within the area, especially endangered or threatened species; - Procedures regarding how to proceed if alive, injured, or dead animals are found; - Delimitation of work areas; and - Information regarding appropriate behavior prior to beginning construction.		
Erosion and Sediment Control	Construction and Operation	■ General awareness and procedures concerning water management and the prevention of erosion and sedimentation; ■ General awareness on key indicators of erosion and sedimentation in order to apply corrective actions; ■ The appropriate disposal methods of collected stormwater.	All Employees	Induction training/yearly refreshers
Waste Management	Construction and Operation	Employees and contractors willshould be trained in proper waste management, including classification.		Induction training/yearly refreshers
Water Management	Construction and Operation	■ General awareness and procedures concerning water management and conservation ■ Emergency procedures in case of water leaks ■ The appropriate disposal methods of hazardous materials or industrial wastewater to ensure they are	All Employees	Induction training/yearly refreshers

Topic	Project Phase	Required Training	Personnel Required	Frequency of Training
		not disposed of in the facility's sanitary sewer system.		
Air Emissions	Construction and Operation	■ General awareness and procedures concerning emissions management. ■ Personnel involved with the air emissions generation will receive additional training including refresher and updates to the training.		
Noise Management	Construction and Operation	All Project construction and operational staff will be trained regarding proper use of PPE, and will be informed of tasks where noise levels exceed 85 dBA to ensure that PPE is used during completion of these tasks.	All Employees	Induction training/yearly refreshers
Natural Disasters	Construction and Operation	All personnel on site will receive training on procedures and actions to perform before, during, and after an emergency. After organizing the site's Emergency Brigade, they will be trained on the content of the Natural Disasters Management Plan and their responsibilities and duties in case of each type of emergency will be explained.	All Employees	Induction training/yearly refreshers
		In addition to the training, emergency response drills will also be conducted at least yearly. The drills will be conducted without notice and the response times will be monitored and recorded.	All Employees	Yearly
		The Emergency Response Plans will be reviewed and revised if improvements are needed after the drills. After the drill, trainings will be organized to resolve any faults encountered during the drills.	All Employees	When changes are made to the plan in response to a drill or an emergency response.

Topic	Project Phase	Required Training	Personnel Required	Frequency of Training
Well Blowouts	Construction	Well control certification program (API, IADC, or similar governing body)	All tool pushers and drilling superintendents	At employment inception and every two years after
	Operation	Emergency Response Training and mock drills	All Plant Personnel	Induction training/yearly refreshers
Emergency Response	Construction and Operation	Drills – Practice Emergency Response Drills and evaluation	All Plant Personnel	Every 6 months
	Construction and Operation	Emergency Response Training – Implementation of the Emergency Response Plan, roles and responsibilities.	All Plant Personnel	Yearly for plant personnel, refresher every 6 months for Emergency Response Team
Site Security	Construction and Operation	Receive specific training on: ■ Site Security Plan and its implementation in order to ensure that response to any dangerous situation is adequate. ■ External Grievance Mechanism	Employees with Security responsibilities	Induction training/yearly refreshers
Workers Health and Safety	Construction and Operation	During Health and Safety Training, all personnel will be trained on: ■ Risk Identification and Analysis ■ High risk activities and work permits ■ PPE ■ Personnel Health ■ Emergency response ■ Traffic and Site Access ■ Obligations and forbidden actions	All Employees	Induction training/yearly refreshers

Topic	Project Phase	Required Training	Personnel Required	Frequency of Training
		■ Code of Conduct		
Labor Conditions	Construction and Operation	Anyone who has a supervisory role and/or a direct hiring role is required to be trained on: ■ Working Conditions and Management of Worker Relationship ■ Human Resources Policy ■ Working conditions and terms of employment ■ Worker's organizations ■ Non-Discrimination and Equal Opportunity ■ Gender Equality ■ Retrenchment ■ Grievance Mechanism ■ Workforce Requirements ■ Occupational Health and Safety ■ Hiring Requirements ■ Communication mechanisms ■ Workers engaged by third parties ■ Performance Management Process	Managers and Human Resources Personnel	Induction training/yearly refreshers
	Construction and Operation	All Employees will be trained on their rights including: ■ Working conditions and terms of employment ■ Grievance Mechanisms	All Employees	Induction training
Internal Grievances	Construction and Operation	All Employees will be trained on the implementation of the Internal Grievance Mechanism, it's confidentiality and their protection from retaliation.	All Employees	Induction training
	Construction and Operation	The Grievance Mechanism Team will be trained on: ■ Roles and Responsibilities,	Grievance Mechanism Team	Induction training/yearly refreshers

Topic	Project Phase	Required Training	Personnel Required	Frequency of Training
		■ GM Database ■ Grievance Mechanism Procedures		
Community Health and Safety	Construction and Operation	Trained on: ■ Health and Safety Risk Identification Associated to Affected Communities ■ Emergency and Preparedness Response Plan ■ Community Health and Safety Measures ■ Communication of Information	Community Relations Team, Community Relations Supervisor and anyone else tasked with implementing the Community Health and Safety Plan	Induction training/yearly refreshers
External Grievances	Construction and Operation	The Community Relations Team will be trained on: ■ Roles and Responsibilities, ■ GM Database ■ Grievance Mechanism Procedures	Community Relations Team	Induction training/yearly refreshers
Contractor Management	Construction and Operation	Anyone who has a supervisory role and/or a direct hiring role is required to be trained on: ■ Contractor Management Procedures ■ Training and Competency ■ Contractor Supervision Procedure	Managers and Human Resources Personnel	Induction training/yearly refreshers
Stakeholder Engagement	Construction and Operation	Training on the Stakeholder Engagement Plan, including: ■ Identification of Stakeholders ■ Stakeholder Mapping and prioritization of stakeholders ■ Disclosure of information and community participation ■ Communication tools ■ Scheduling communication and engagement activities	Community Relations Team, Contractors	Induction training/yearly refreshers

Topic	Project Phase	Required Training	Personnel Required	Frequency of Training
		■ Recordkeeping		
COVID-19	Construction and Operation	All personnel will be provided guidelines and practices regarding COVID-19	All Employees	Document shared at the start of site activities
Archeological Change Finds	Construction	All Project Construction personnel will receive training and demonstrate competency in the identification of chance finds and the Chance Find Procedure	All Construction Personnel	Induction training
Transportation	Construction and Operation	Personnel will be trained on the implementation of the Traffic Management Plan, including: ■ Driver Safety Measures ■ Vehicle Integrity ■ Route Management ■ Road Condition ■ Noise, Vibration and Dust ■ Transportation Safety within the Site ■ Communication with Community Stakeholders	All Personnel	Induction training/yearly refreshers

8.21.4 Documentation and Monitoring

Documentation of all training is required to be kept on-site, by Human Resources, for NREI and all contractors. Implementation of this procedure is reviewed through internal and external (when applicable and available) audit results and other inspection processes.

8.21.5 Key Performance Indicators

The table below presents the key performance indicators that will evaluate the implementation of this plan:

Table 8-60: Key Performance Indicators

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool/Frequency
Trainings	Total number of trainings carried out in the stipulated time frame	100% of trainings carried out in the stipulated time frame	Construction and Operation	Human Resources training records / monthly

Impact	Indicator	Performance Goals/ KPIs	Project Phase	Method/Tool/Frequency
Workers	Percentage of trained workers	100% of trained workers	Construction and Operation	Human Resources training records / monthly

8.22 ESMP Estimated Costs

This chapter provides a list of proposed and recommended management and mitigation measures and provides a preliminary estimated cost for their implementation. This preliminary estimated costs will need to be reviewed at the exact moment of the implementation of the management plan. Some of the costs presented here will vary depending on the local market conditions and availability of the resources.

Table 8-61: ESMP Estimated Costs

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
All	Staff	Personnel per roles and responsibilities of ESMP		Pre-construction	$70-90k $15-25k
Biodiversity Management Plan	Flora and Fauna	Pre-vegetation clearing surveys by a terrestrial plant and fauna specialists	Labor	Construction	$3-5k
		Wildlife Specialist for Oversight and Animal rescue and relocation	Labor	Construction	$2-4k
		Tree Fellers for vegetation removal	Labor	Construction	$1-2k
		Revegetation	Labor and Supplies	Construction	$3-5k
Biodiversity Management Plan	Health and Safety	Training and signs	Labor and Supplies	Construction	$2k
	Soil and Water	Monitoring – Sample analysis	Labor and Supplies	Operation	$3-5k

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
Erosion and Sediment Control Plan		Erosion and Sediment Control Measures – Silt fences, berms, temporary storage, seeding, tarps	Labor and Supplies	Construction	$5-10k
		Monitoring – Sample analysis	Labor and Supplies	Construction	$3-5K
	Health and Safety	Training and Inspections	Labor	Construction	$2k
		Training and Inspections	Labor	Operation	$2k
Waste Management Plan	Soil and Water	Material Storage	Supplies	Construction	$1k
		Material Disposal Costs	Supplies	Construction	$5-10K
		Monitoring – Sample analysis	Labor and Supplies	Construction	$3-5k
		Material Storage	Supplies	Operation	$1k
		Material Disposal Costs	Supplies	Operation	$2-4k
		Monitoring – Sample analysis	Labor and Supplies	Operation	$1-2k
	Health and Safety	PPE	Supplies	Construction	$6-10k
		Training and Inspections	Labor	Construction	$2k
		PPE	Supplies	Operation	$2-4k
		Training and Inspections	Labor	Operation	$2k
	Soil and Water	Monitoring – Sample analysis	Labor and Supplies	Construction	$3-5k

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
Water Management Plan		Wastewater storage and disposal	Supplies	Construction	$1-5k
		Monitoring – Sample analysis	Labor and Supplies	Operation	$1-2k
		Septic System maintenance	Labor and Supplies	Operation	$1-2k
	Health and Safety	Potable water and storage	Supplies	Construction	$5-10k
		Potable water and storage	Supplies	Operation	$5-10k
Air Emissions Management Plan	Air and Health and Safety	Air Emissions Monitoring – Includes Hydrogen Sulfide and n-pentane	Supplies	Construction	$5-10k
		Dust control practices – soil wetting, seeding.	Supplies	Construction	$1k
		Training and Inspections	Labor	Construction	$2k
		Air Emissions Monitoring – Includes Hydrogen Sulfide and n-pentane	Supplies	Operation	$3-5k
		Dust control practices – soil wetting, seeding.	Supplies	Operation	$1k
		Training and Inspections	Labor	Operation	$2k
Noise Management Plan	Fauna and Health and Safety	Noise Monitoring	Supplies	Construction	$3-6k
		PPE	Supplies	Construction	$2-4k

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
	Health and Safety	Training	Labor	Construction	$2k
		Noise Monitoring	Supplies	Operation	$3-6k
		PPE	Supplies	Operation	$2-4k
		Training	Labor	Operation	$2k
Natural Disaster Management Plan	Health and Safety	Training	Labor	Construction	$2k
		Emergency response equipment (flashlights, water, etc.)	Supplies	Construction	$1-2k
		Audible Alarms	Supplies	Construction	$1-2k
		Training	Labor	Operation	$2k
		Emergency response equipment (flashlights, water, etc.)	Supplies	Operation	$1-2k
		Audible Alarms	Supplies	Operation	$1-2k
Well Blowout Prevention	Health and Safety	Training	Labor	Construction	$2k
		Training	Labor	Operation	$2k
Emergency Response Plan	Water, Soils, Health and Safety	Emergency response equipment – first aid/PPE, fire, spill response, security	Supplies	Construction	$3-5k
		Emergency response equipment – first aid/PPE, fire, spill response, security	Supplies	Operation	$3-5k
	Health and Safety	Training	Labor	Construction	$2k
		Training	Labor	Operation	$2k

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
Security Management Plan	Health and Safety	Training	Labor	Construction	$2k
		Security Equipment – Cameras, fences, locks.	Supplies	Construction	$3-4k
		Training	Labor	Operation	$2k
Workers Health and Safety Management Plan	Health and Safety	Training	Labor	Construction	$2k
		PPE/Safety Equipment for personnel – for example: steel toe boots, hard hats, high visibility vests, earplugs, safety glasses	Supplies	Construction	$4-6k
		Training	Labor	Operation	$2k
		PPE/Safety Equipment for personnel – for example: steel toe boots, hard hats, high visibility vests, earplugs, safety glasses	Supplies	Operation	$3-5k
Labor Conditions and Workers Selection Plan	Socioeconomic, gender and social inclusion	Additional External Communications	Fees/Supplies	Construction	$1-3k
		Training	Labor	Construction	$2k
		Additional External Communications	Fees/Supplies	Operation	$1-2k
		Training	Labor	Operation	$2k
Internal and External Grievance Mechanism	Socioeconomic	Additional External Communications	Fees/Supplies	Construction	$1-3k
		Training	Labor	Construction	$2k
		Additional External Communications	Fees/Supplies	Operation	$1-2k

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
		Training	Labor	Operation	$2k
Community Health and Safety Plan	Health and Safety	Training	Labor	Construction	$2k
		Additional External Communications	Fees/Supplies	Construction	$1-3k
		Training	Labor	Operation	$2k
		Additional External Communications	Fees/Supplies	Operation	$1-2k
Stakeholder Engagement Plan	Socioeconomic	Additional External Communications, Public Consultation, Disclosure of Information, Stakeholder Database	Fees/Supplies	Construction	$2-4k
		Training	Labor	Construction	$2k
		Additional External Communications, Public Consultation, Disclosure of Information, Stakeholder Database	Fees/Supplies	Operation	$1-2k
		Training	Labor	Operation	$2k
COVID-19 Engagement Plan	Health and Safety, Socioeconomics	Training	Labor	Construction	$2k
		Additional External Communications, Community Engagement	Fees/Supplies	Construction	$1-3k
		PPE – Face masks, hand sanitizer, cleaning supplies, testing kits	Supplies	Construction	$2-3k
		Training	Labor	Operation	$2k

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
		Additional External Communications, Community Engagement	Fees/Supplies	Operation	$1-2k
		PPE – Face masks, hand sanitizer, cleaning supplies, testing kits	Supplies	Operation	$1-2k
Chance Find Plan	Cultural Heritage	Training	Labor	Construction	$2k
Transportation Management Plan	Health and Safety	Training	Labor	Construction	$2k
		Vehicle Inspections	Labor and Supplies	Construction	$1k
		Vehicle, Equipment and Road Maintenance (includes dust suppression, erosion control, etc.)	Labor and Supplies	Construction	$5-8k
		Road Signs/PPE	Supplies	Construction	$1k
		Additional External Communications, Grievance Mechanism	Fees/Supplies	Construction	$1-3k
		Training	Labor	Operation	$2k
		Vehicle Inspections	Labor and Supplies	Operation	$1k
		Vehicle, Equipment, and Road Maintenance	Labor and Supplies	Operation	$3-5k
		Road Signs/PPE Repairs	Supplies	Operation	$1-2k
		Additional External Communications,	Fees/Supplies	Construction	$1-2k

Plan	Resource	Management Measure	Cost Type	Project Phase	Preliminary Estimated Cost
		Grievance Mechanism			

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APPENDIX A BIODIVERSITY LIST

Adapted from "Terrestrial Biodiversity Inventory and Status Assessment of NPPA" conducted in 2009 by the Organization of Eastern Caribbean States' (OECS) Environmental and Sustainable Development Unit funded by USAID

FAMILY	**TAXON**	**COMMON NAME**	**FORM**	**NOTES**
DICOTYLEDON TREES and SHRUBS				
Acanthaceae	*Odontenema nitidum*		Shrub	
	Anacardium occidentale		Tree	
	Comocladia dodonaea	Mango	Shrub	
	Mangifera indica		Tree	Introduceduced
Annonaceae	*Annona glabra*	Ghaut apple	Tree	
	Annona muricata	Soursap	Tree	
	Annona squamosa	Sugar apple	Tree	
Apocynaceae	*Cryptostegia grandiflora*	Purple allamanda	Shrub/Climber	Introduceduced
	Plumeria alba	Frangipani	Shrub	
	Rauvolfia viridis		Shrub	
	Tabernaemontana citrifolia		Tree	
	Calotropis procrea	Giant milkweed	Shrub	
Araliaceae	*Polyscias sp.*		Shrub	

Lobeliaceae	*Lobelia circifolia*		Herb	
Asteraceae	*Pluchea carolinensis*		Shrub	
Bignoniaceae	*Bourreria succulenta*		Tree	
	Crescentia cujete	Calabash	Tree	
	Tabebuia heterophylla		Tree	
	Tecoma stans(?)		Shrub	
Burseraceae	*Bursera simaruba*	Turpentine	Tree	
	Dacryodes excelsa	Incense tree	Tree	
Capparaceae	*Capparis baducca*		Shrub	
	Capparis cynophallophora		Tree	
	Capparis flexuosa		Tree	
Cunoniaceae	*Weinmannia pinnata(?)*		Tree	
Caricaceae	*Carica papaya*	Papaya, papoy	Tree	
Causuarinaceae	*Casuarina sp.*		Tree	
Celastaceae	*Cassine xylocarpa*		Tree	
Chrysobalanaceae	*Hirtella triandra*		Tree	
Theaceae	*Freziera undulata*	Mountain parrot, pigeon berry	Tree	
Clusiaceae	*Clusia major*		Tree	
	Mammea americana		Tree	
Combretaceae	*Conocarpus erectus*	Button mangrove	Tree	
Euphorbiaceae	*Croton astroites*		Shrub	
	Croton flavens		Shrub	

	Codiaeum variegatum		Shrub	Introduceduced
	Euphorbia triloba	Milk cactus	Shrub	Introduceduced
	Hippomane mancinella	Manchioneel	Tree	
	Hura crepitans	Sandbox	Tree	
	Sapium caribaeum		Tree	
	Drypetes glauca		Tree	
Goodeniaceae	*Scaevola sericea*		Shrub	
Lauraceae	*Aniba bracteata*	Red sweetwood	Tree	
	Beilschmiedia pendula	Sweetwood	Tree	
	Licaria salicifolia		Tree	
	Ocotea floribunda		Tree	
Leguminosae-Caesalpinioideae	*Delonix regia*		Tree	Introduceduced
	Haematoxylon campechianum	Logwood	Tree	
	Hymenaea courbaril		Tree	
	Senna alata		Shrub	
	Senna bicapsularis		Shrub	
	Senna obtusifolia		Shrub	
	Chamaecrista glandulosa		Shrub	
	Tamarindus indica		Tree	Introduceduced
Leguminosae-Faboidea	*Dalbergia ecastaphyllum*		Shrub	
	Flemingia strobilifera	Wild hops	Shrub	Introduceduced
	Gliricida sepium		Tree	Introduceduced

	Indigofera suffruticosa		Shrub	
	Indigofera tinctoria		Shrub	Introduceduced
	Piscidia carthagenensis		Tree	
	Ormosia monosperma	Snakewood	Tree	
	Sesbania sp.		Shrub	
	Sesbania sp.		Shrub	
	Sesbania sp.		Shrub	
Leguminosae- Mimosoideae	*Acacia* spp.	Acacia	Tree	Introduceduced
	Adenanthera pavonia	Sandal wood	Tree	Introduceduced
	Albizia lebbeck		Tree	Introduceduced
	Inga laurina		Tree	
	Leucaena leucocephala		Tree	Introduceduced
	Pithecellobium unguis-cati		Tree	
Erythroxylaceae	*Erythroxylum havanense*		Tree	
Malpighiaceae	*Brysonima spicata*		Tree	
Malvaceae	*Malachra alceifolia*		Shrub	
	Pavonia spinifex		Shrub	
	Sidastrum multiflorum		Shrub	
	Urena lobata		Shrub	
Malvaceae/Bombacaceae	*Ceiba pentandra*	Silk cotton	Tree	
Malvaceae/Sterculiaceae	*Guazuma ulmifolia*		Tree	
	Melochia nodiflora		Shrub	

	Melochia tomentosa		Shrub	
	Waltheria indica		Shrub	
	Hbiscus rosa-sinensis	Hbiscus	Shrub	Introduceduced
Malvaceae/Tiliaceae	*Triumfetta lappula*		Shrub	
Theophrastaceae	*Jacquinia amillaris*	Torchwood	Shrub	
Myrsinaceae	*Myrsine coriacea(?)*		Tree	
Sapotaceae	*Pouterua multiflora*	Penny piece	Tree	
Symplocacaceae	*Symplocos martinicensis*		Tree	
Melastomataceae	*Charianthus purpureus(?)*		Shrub	
	Clidemia hirta		Shrub	
	Miconia impetrolaris		Shrub	
	Miconia laevigata		Shrub	
Meliaceae	*Swietenia mahogani*		Tree	
	Cecropia schreberiana	Trumpet tree	Tree	
	Ficus americana		Tree	
	Ficus citrifolia		Tree	
	Ficus obtusifolia		Tree	
Thymelaeaceae	*Daphnopsis americana*	Mahoe	Tree	
Rhizophoraceae	*Rhizophora mangle(?)*	Red mangrove	Tree	
Combretaceae	*Conocarpus erectus*	Buttonwood	Tree	
	Laguncularia racemosa	White mangrove	Tree	
	Terminalia catappa	Almond	Tree	Introduceduced
Myrtaceae	*Eugenia biflora*		Tree	

	Eugenia axillaris		Tree	
	Eugenia ligustrina		Tree	
	Eugenia uniflora		Tree	
	Myrcia citrifolia		Tree	
	Myrcia deflexa		Tree	
	Pimenta racemosa	Cinnamon	Tree	
	Psidium guajava	Guava	Tree	
Olacaceae	*Schoepfia schreberi*		Tree	
Nyctaginaceae	*Pisonia aculeata*		Tree	
	Pisonia subcordata	White loblolly, White mampoo	Tree	
	Guapira fragrans	Black loblolly, Black mampoo	Tree	
Phyllanthaceae	*Phyllanthus epiphyllanathus*		Shrub	
Piperaceae	*Piper dilatatum*		Shrub	
	Piper reticulatum		Shrub	
Chloranthaceae	*Hedyosmum arborescens*		Tree	
Plambaginaceae	*Plumbago scandens*		Shrub	
Polygonaceae	*Coccoloba diversifolia*		Tree	
	Coccoloba pubescens		Tree	
	Coccoloba swartzii		Tree	
	Coccoloba uvifera		Tree	
	Coccoloba venosa		Tree	
Rhamnaceae	*Ziziphus mauritiana*	Pommesarat, dunks	Tree	Introduceduced

Rubiaciae	*Chiococca parviflora*		Tree	
	Erithalis fruticosa		Tree	
	Faramea occidentalis	Wild coffee	Tree	
	Gonzalagunia hirsuta		Tree	
	Guettarda scabra		Tree	
	Guettarda odorata		Tree	
	Palicourea crocea		Shrub	
	Psychotria nervosa		Shrub	
	Psychotria tenuifolia		Shrub	
	Randia aculeata		Shrub	
Rutaceae	*Citrus aurantium*			
	Amyris elemifera		Tree	
	Triphasia trifolia	Myrtle lime	Shrub	
	Zanthoxylum martinicense		Tree	
	Zanthoxylum punctatum		Tree	
	Zanthoxylum monophyllum		Tree	
	Zanthoxylum spinifex(?)		Shrub	
Salicaceae	*Samyda dodecandra*	Wild guava	Tree	
Sapindaceae	*Melicoccus bijugatus*	Guinep	Tree	Introduceduced
Simaroubiaceae	*Simarouba amara*		Tree	
	Picrasma excelsa		Tree	
Sapotaceae	*Chrysophyllum argenteum*		Tree	
	Sideroxylon obavatum		Tree	

Solanaceae	*Solanum sp.*		Shrub	
	Solanum racemosum	Dolly tomato	Shrub	
	Solanum torvum		Shrub	
Theophrastaceae	*Jacqininia armillaris*		Tree	
	Jacqininia berterii		Tree	
Ulmaceae	*Trema macracantha*		Tree	
Verbenaceae	*Citharexylum fruiticosum*		Tree	
	Clerodendrum aculeatum		Shrub/Climber	
	Lantana camara	Sage	Shrub	
	Lantana involucrata	Sage	Shrub	

VINES AND CLIMBERS

Asclepiadaceae	*Metastelma parviflorum*		Vine	
Boraginaceae	*Tournefortia microphylla*		Vine	
Convolvulaceae	*Cuscuta americana*		Vine	
	Ipomoea obscura		Vine	
	Ipomoea pes-capre	Beach morning glory	Vine	
	Ipomoea tiliaceae		Vine	
	Argyreia nervosa		Vine	Introduceduced
	Jacquemontia cumenensis		Vine	
	Merremia aegyptia		Vine	
	Merremia dissecta		Vine	
	Meremia quinquefolia		Vine	

	Merremia umbellata		Vine	
	Stictocardia tiliifolia		Vine	
	Turbina corymbosa		Vine	
	Poranopsis paniculata		Vine	
Cucurbitaceae	*Cayaponia americana*		Vine	
	Cayaponia racemosa		Vine	
	Melothria pendula		Vine	
	Momordica charantia	Wash woman, lizard food	Vine	Cultivated
Euphorbiaceae	*Tragia volubilis*	Stinging nettle	Vine	
Leguminosae- Caesalpinioides	*Caesalpinia bonduc*	Warri	Climber	
Leguminosae-Faboideae	*Abrus precatorius*	Jumbie bead	Vine	
	Centrosema virginianum		Vine	
	Canavalia rosea	Beach bean	Vine	
	Clitoria ternatea		Vine	
	Galactia dubia		Vine	
	Galactia rubra		Vine	
	Galactia striata		Vine	
	Lablab purpureus		Vine	
	Mucuna pruriens		Vine	
	Mucuna urens		Vine	
	Rhynchosia minima		Vine	
	Rhynchosia reticulata		Vine	

	Teramnus labialis		Vine	
Malpighiaceae	*Heteropterys purpurrea*		Vine	
	Stigmaphyllon emarginatum		Vine	
Menispermaceae	*Cissampelos pareira*	Velvet leaf	Vine	
Oleaceae	*Jasminum fluminense*		Vine	Introduceduced
Passifloraceae	*Passiflora edulis*		Vine	
	Passiflora laurifolia		Vine	
	Passiflora rubra		Vine	
	Passiflora suberosa		Vine	
Polygonaceaea	*Antigonon leptopus*	Coralita	Vine	Introduceduced
Rhamnaceae	*Gouania lupuloides*		Vine	
Rubiaceae	*Chiococca alba*		Vine	
Ulmaceae	*Celtis iguanaea*		Vine	
Verbenaceae	*Petrea kahautiana*		Vine	
Vitaceae	*Cissus verticillata*		Vine	

HERBACEOUS PLANTS

Gesneriaceae	*Alloplectus cristatus*		Herb	
Lentibulariaceae	*Utricularia alpine(?)*		Herb	
Acanthaceae	*Asystasia gangetica*	Chinese Violet	Herb	Introduced
	Blechum pyramidatum		Herb	
	Justicia pectoralis		Herb	
	Justicia sessilis		Herb	

	Justicia sp.		Herb	
	Ruellia tuberosa		Herb	
Aizoaceae	*Sesuvium portulacastrum*		Herb	
	Trianthema portulacastrum(?)		Herb	
Portulacaeae	*Talinum paniculatum(?)*		Herb	
Urticaeae	*Pilea microphylla*		Herb	
Amaranthaceae	*Achyranthes aspera*	Man better one	Herb	
Apocynaceae	*Asclepias curassivicum*		Herb	
	Catharanthus roseus	Periwinkle	Herb	Introduced
Asteraceae	*Ageratum conyzoides*		Herb	
	Bidens cynapiifolia		Herb	
	Bidens pilosa		Herb	
	Centratherum punctatum		Herb	
	Lagascea mollis		Herb	
	Tithionia diversifolia		Herb	
	Wedelia calycina		Herb	
	Xanthium strumarium		Herb	
Boraginaceae	*Heliotropium angiospermum*		Herb	
	Heliotropium curassavicum		Herb	
	Heliotropium indicum		Herb	
Brassiceae/Cruciferae	*Cakile lanceolata*		Herb	
	Lepidum virginicum		Herb	

Capparaceaea	*Cleome viscosa*		Herb	
Caryophyllaceae	*Drymaria cordata*		Herb	
Crassulaceae	*Bryophyllum pinnatum*	love bush	Herb	
Euphorbiaceae	*Croton lobatus*		Herb	
	Chamaesayce spp.		Herb	
	Jatropha gossypifolia		Herb	
Phyllanthaceae	*Phyllanthus amarus*		Herb	
	Phyllanthus niruri		Herb	
	Phyllanthus urinaria		Herb	
Lamiaceae	*Leonotis nepetifolia*		Herb	
	Salvia occidentalis		Herb	
Leguminosae-Faboideae	*Alysicapus viginalis*	Moneywort	Herb	
	Desmodium axillare		Herb	
	Macroptilium artropurpureum		Herb	
	Vigna lutea	Cow pea	Herb	
Leguminosae- Mimosioidea	*Mimosa pudica*	Sensitive plant	Herb	
	Desmanthus virgatus		Herb	
Malvaceae/Sterculiaceae	*Melochia pyramidata*		Herb	
Malvaceae/Tiliaceae	*Corchorus aestuans*		Herb	
Rubiaceae	*Relbunium guadalupense*		Herb	
Ochnaceae	*Sauvagesia erecta*		Herb	
Violaceae	*Viola stipularis*		Herb	

Onagraceae	*Ludwigia erecta*		Herb	
	Ludwigia octovalis		Herb	
Oxalidaceae	*Oxalis barrelieri*		Herb	
	Oxalis corniculata		Herb	
Papaveraceae	*Argemone americana*	Prickly poppy	Herb	
Nyctaginaceae	*Boerhavia coccinea(?)*		Herb	
Phytolaccaceae	*Petiveria alliaceae*	Stinking bush	Herb	
	Rivina humilis		Herb	
Piperaceae	*Peperomia sp.*		Herb	
Solanaceae	*Datura inoxia*		Herb	
	Datura metel		Herb	
	Nicotiana tabacum	Tobacco	Herb	
	Solananum americanum		Herb	
Turneraceae	*Turnera ulmifolia*	Yellow alder	Herb	
Umbelliferae	*Eryngium foetidum*	Clacla	Herb	
Boraginaceae	*Cordia curiassavica*		Shrub	
	Cordia globosa		Shrub	
	Cordia sp.		Tree	
	Cordia obliqua		Tree	
	Cordia reticulata		Tree	
	Cordia sulcata		Tree	
	Cordia sp.		Tree	
	Cordia curiassavica		Shrub	

Verbenaceae	*Priva lappulacea*		Herb	
	Starchytarpheta cayennensis		Herb	
	Stachytarpheta jamaicensis	Vervain	Herb	
Zygollaceae	*Kallstroemia maxima*		Herb	

MONOCOTS

Agavaceae	*Agave karrato*		Shrub	
	Agave sp.		Shrub	
	Furcraea tuberosa		Shrub	
	Sansevieria sp.		Herb	Introduced
Amaryllidaceae	*Hippeastrum punctatum*	Lily	Herb	Introduced
	Hymenocallis caribaea	Lily	Herb	
Araceae	*Anthurium grandifolium*	Anthurium	Herb	
	Anthurium sp.		Herb	
	Anthurium sp.		Herb	
	Dieffenbachia seguine	Dumbcane	Herb	
	Monstera adansonii		Herb	
	Philodendron scandens		Herb	
	Philodendron giganteum		Shrub	
Bromeliaceae	*Bromelia pinguin*		Herb	
	Tillandsia utriculata		Herb	
	Aechmea sp.		Herb	
	Pitcairnia angustifolia		Herb	

Canaceae	*Canna indica*	Lily	Herb	
Commelinaceae	*Commelina sp.*	Water grass, French weed	Herb	
	Callisia repens		Herb	
	Rhoeo spathacea		Herb	
Dioscoreaceae	*Dioscorea polygonoides*		Vine	
Heliconaceaea	*Heliconia caribaea*		Shrub	
Maranthaceae	*Marantha arundinacea*	Arrowroot	Herb	
Orchidceae	*Tolumnia urophyllum*		Herb	
	Vanilla planifolia	Vanilla	Vine	
	Erythrodes plantaginea(?)		Herb	
Palmae	*Acrocromia aculeata*		Tree	
	Cocoa nucifera	Coconut	Tree	Introduced
	Euterpe globosa	Mountain cabbage palm	Tree	
	Roystonea oleraceae		Tree	
Podocarpaceae	*Podocarpus coriaceus*		Tree	

FERNS

Lycopodiaceae	*Lycopodium* spp.	Clubmoss	Herb	
Selaginellaceae	*Selaginella* sp.	Spikemoss	Herb	
Cyatheaceae	*Cyathea arborea*	West Indian tree fern	Tree-like	
Hymenophyllaceae	*Trichomanes krugii*		Herb	
Hymenophyllaceae	*Trichomanes membranaceum*		Herb	
	Campylaneurum latum		Herb	

Polypodiaceae	*Blechnum occidentale*		Herb	
	Acrostichum danaefolium	Leather fern	Herb	
	Adiantum tenerum		Herb	
	Asplenium cristatum		Herb	
	Asplenium sp.		Herb	
	Tectaria incisa		Herb	
	Microgramma lycopodioides		Herb	
	Microgramma piloselloides		Herb	
	Nephrolepsis hispatula		Herb	
	Pteris biaurita		Herb	
	Thelypteris kunthii		Herb	
	Thelypteris tretragona		Herb	
	Thelypteris sp.	Pepper fern	Herb	

CACTI

Cactaceae	*Hylocereus trigonatus*	Night blooming cacti	Climber	
	Pilosocereus royeni		Tree	
	Mammilaria nivosa		Herb	
	Melocactus intortus		Herb	
	Opuntia spp.(?)		Shrub	

GRASSES

Poaceae/Graminiae	*Bambusa vulgaris*	Bamboo	Tree-like	Introduced
	Vetiveria zizanioides	Veteveria	Herb	Introduced
	Lasiacis sp.	Bamboo grass	Herb	
	Sporobolus virginicus	Beach grass	Herb	
	Scleria sp.		Herb	
	Isachne angustifolia		Herb	
	Isachne rigidifolia		Herb	

APPENDIX B LIST OF ESMP APPENDICES

Appendix 12-A Internal Claim Form

	INTERNAL CLAIM FORM
GRIEVANCE FORM	
GRIEVANCE Nº	
EMPLOYEE COMPANY	
GRIEVANCE TYPE	

(indicate whether this is a concern, claim, or a suggestion)

PERSONAL INFORMATION*

*Surnames:		*Address:	
*Names:		*Telephone:	
Gender:		Address:	
Age:		Professional occupation:	
Labor relationship with NREI	Permanent	Professional Service	Other (specify)
* Not mandatory information. You may submit this form anonymously.			

REASON FOR THE CLAIM

Details: *(indicate when did the events of this claim occurred, who was involved, foundations, evidence and any other relevant information).*	
Response requested (describe what is requested based on the claim)	
Attached and/or delivered documents Information attached: YES □ NO□ Indicate which are the documents and attach them.	

Signature:	Date:
Receptor Signature:	Date:

We appreciate your comments; please keep a copy for follow-up. Thank you.

Appendix 12-B Communication Form

Communication Report

File No.:	_____	Contact Date:	_____
Stakeholder Name:	_____	Next Contact Date:	_____
Municipality:	_____	Contact Reason:	_____
State:	_____	Phone:	_____

Comments and/or Agreements:

_____
_____
_____
_____
_____
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_____
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_____
_____
_____
_____

_____ _____

Manager **Coordinator**

Note: This community report can be filled in by legible handwriting or by computer.

Appendix 12-C Example of Grievance Database

Community Grievance Mechanism

NEVIS G

The date is tracked to measure response time and resolution time.

Can include "anonymous"

Type of complaint. Keep in mind that this information can be used later for analysis and

The unit or contractor in charge of addressing the complaint.

Manager in charge of resolving the complaint.

Date the company implements the resolution of a complaint.

Based on oral or written comments by the complainant.

Based on oral or written comments by the complainant.

No.	Case #	Date receive	Received by	Name of the complainar	Community	Brief description of the complaint	Category	Date of receipt of complai	Unit or contractor responsi	Person in charge of compla	Solution or response proposed to complainant	Date of resolutio	Closure date	Satisfied with the proce (yes/no	If not, why not?	Satisfied with the result (yes/no	If not, why not?
1	13-005-AP	23-Jan-13	Betty Blue	George Smith	Community	Dust at construction site	Nuisance	24-Jan-13	Cleaning team	Terry Jones	Implement measures to reduce dust	25-Jan-13	25-Jan-13	Yes		Yes	

For cross-referencing to internal incident reporting system (if applicable)

The date the company and the complainant agree that all necessary steps have been taken to resolve the complaint, or the company determines that no other reasonable action can be taken to resolve a complaint.

Appendix 14-A External Claim Form

	External CLAIM FORM		
GRIEVANCE FORM **GRIEVANCE Nº** **EMPLOYEE COMPANY** **GRIEVANCE TYPE** *(indicate whether this is a concern, claim, or a suggestion)* **PERSONAL INFORMATION***			
*Surnames:		*Address:	
*Names:		*Telephone:	
Gender:		Address:	
Age:		Professional occupation:	
Labor relationship with NREI	Permanent	Professional Service	Other (specify)
* Not mandatory information. You may submit this form anonymously.			
REASON FOR THE CLAIM			
Details: *(indicate when did the events of this claim occurred, who was involved, foundations, evidence and any other relevant information).*			
Response requested (describe what is requested based on the claim)			
Attached and/or delivered documents Information attached: YES □ NO□ Indicate which are the documents and attach them.			

Signature:	Date:
Receptor Signature:	Date:
We appreciate your comments; please keep a copy for follow-up. Thank you.	

Appendix 14-B Communication Form

Communication Report

File No.:	_____	Contact Date:	_____
Stakeholder Name:	_____	Next Contact Date:	_____
Municipality:	_____	Contact Reason:	_____
State:	_____	Phone:	_____

Comments and/or Agreements:

_____
_____
_____
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_____
_____

Manager	**Coordinator**

Note: This community report can be filled in by legible handwriting or by computer.

Appendix 14-C Example of Grievance Database

Community Grievance Mechanism

NEVIS G

The date is tracked to measure response time and resolution time.

Can include "anonymous"

Type of complaint. Keep in mind that this information can be used later for analysis and

The unit or contractor in charge of addressing the complaint.

Manager in charge of resolving the complaint.

Date the company implements the resolution of a complaint.

Based on oral or written comments by the complainant.

Based on oral or written comments by the complainant.

No.	Case #	Date receive	Received by	Name of the complainan	Community	Brief description of the complaint	Category	Date of receipt of complai	Unit or contractor responsil	Person in charge of compla	Solution or response proposed to complainant	Date of resolutio	Closure date	Satisfied with the proces (yes/no	If not, why not?	Satisfied with the result (yes/no	If not, why not?
1	13-005-AP	23-Jan-13	Betty Blue	George Smith	Community	Dust at construction site	Nuisance	24-Jan-13	Cleaning team	Terry Jones	Implement measures to reduce dust	25-Jan-13	25-Jan-13	Yes		Yes	

For cross-referencing to internal incident reporting system (if applicable)

The date the company and the complainant agree that all necessary steps have been taken to resolve the complaint, or the company determines that no other reasonable action can be taken to resolve a complaint.

Appendix 15-A Workers Accommodation Audit

Appendix 15 A – Workers Accommodation Audit

Key Performance Indicator	Yes	No	N/A	Comments
Accommodation				
The location of the facilities is designed to avoid natural hazards (storms, floods, etc.)				
Accommodation facilities are located at a reasonable distance from the workplace				
Accommodation facilities are constructed of suitable materials, maintained in good condition and clean				
Accommodation facilities have electricity and adequate drainage				
Accommodation facilities are heated/ventilated/air-conditioned (depending on climate)				
Accommodation facilities have adequate lighting systems				
Accommodation facilities have specific containers for garbage collection and are emptied regularly				
Pest extermination, vector control and disinfection are carried out on a regular basis				
Rooms/bedrooms are kept in good condition, and are ventilated and cleaned at regular intervals				
The rooms/bedrooms and sanitary facilities are located in the same buildings				
The number of workers sharing the same room/bedroom does not exceed five				
Mobile partitions or curtains are provided				
There are separate sleeping areas for men and women				

There is a separate bed for each worker				
There is a minimum space of 1 meter between beds				
The use of double-decker bunks is minimized				
When using double-decker bunks there is sufficient space between the upper and lower bed				
Triple deck bunks are prohibited				
Workers are provided with comfortable mattresses, pillows and clean bedding				
Bedding is washed frequently and applied with appropriate repellents and disinfectants				
The accommodation areas are separated from the kitchen space				
Adequate washing and drying facilities are provided				
Workers are provided with basic collective social spaces and adequate recreational areas				
Health and safety measures (including emergency preparedness and response measures) are visible within the facility				
The regulation with the rights and duties of the workers is visible inside the facilities				
Regulations regarding alcohol and tobacco consumption and third party access to the camp are visible inside the facilities				
Community relations management guidelines are visible within the facilities				
Worker housing policies and management plans are periodically reviewed and improved.				
The person appointed to manage the accommodation has the background, competence and experience necessary to carry out its mission and is given the appropriate responsibility and authority to do so.				
There are sufficient staff to ensure proper implementation of housing standards (cleaning, cooking, security, etc.)				

Transport				
Transportation provided to workers is safe				
An adequate transport system is provided to and from the surrounding communities				
Water				
Workers have easy access to an adequate supply of potable water within the Site				
Workers have easy access to an adequate supply of clean water within their accommodation				
The quality of the drinking water is regularly monitored.				
Medical services				
First aid kits are provided in adequate quantities				
Are the first aid kits properly stored				
There is an adequate number of staff/workers trained to provide first aid				
There are medical/paramedical staff on site.				
Ambulance or other means of transport are available for the transfer of staff to health facilities.				
Accommodation facilities have a first aid kit				
Food				
The kitchen facilities are built with adequate and easy to clean materials.				
The kitchen floor, ceiling and wall surfaces, adjacent to or above the cooking areas, are constructed of fire-resistant, non-absorbent, durable, non-toxic and easy-to-clean materials.				
The surfaces of the food preparation tables and adjacent walls are equipped with a smooth, durable, non-corrosive, non-toxic and washable surface.				
Suitable sealable containers are available for depositing food and other waste.				

Garbage is frequently removed from the kitchen to avoid accumulation				
The people in charge of the kitchen are adequately trained in the handling and cooking of food.				
The food provided to workers contains nutritional value appropriate to the activities they perform.				
The food provided takes into account the religious/cultural background of the workers.				
Workers are provided with sufficient space in the canteen/dining room.				
Health services				
The sanitary and cleaning facilities are built with easy to clean materials.				
Sanitary and washing facilities are frequently cleaned and maintained in working order.				
Toilets, shower/bathrooms and other sanitary facilities are designed to provide workers with adequate privacy, including roof-to-floor partitions and lockable doors.				
There are separate toilet and washing facilities for men and women.				
There are an adequate number of toilets, urinals and sinks.				
Toilet facilities are conveniently located and easily accessible.				
The shower floor is made of durable, washable anti-slip materials.				
There are an adequate number of showers.				
The shower facilities have an adequate supply of hot and cold running water.				

Appendix 16-A Stakeholder Register

NEVIS GEOTHERMAL

Record of stakeholder engagement

Date (dd-mm-aaaa)	M	PI	NREI Representative Present	Stakeholder representative	Organization	Role	Topic	Materials Distributed	Comments/ Notes	Actions to take	Follow-up