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Dominica Geothermal Development - Environmental and Social Impact Assessment

NZ Ministry of Foreign Affairs & Trade

ESIA Volume 3: Social Impact Assessment

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B	April 2018	Update to baseline following Hurricane Maria	D.Burgdorf	L.Turk	B Clarke
V1	June 2018	Revisions based on comments made by World Bank. FINAL VERSION	D.Burgdorf	L.Turk	B Clarke
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V3	August 2018	Revision based on WB Comments	D.Burgdorf	L.Turk	B Clarke
V4	Oct 2018	Revision based on further WB comments	LF	MT	MT

Contents

Glossary

Acronym	Term	Definition
AoI	Area of Influence	The project AoI is defined through consideration of the project footprint including all ancillary project components and also considering project impacts on various environmental and social components. A number of project areas of influence may result but is best to amalgamate them into an overall project area of influence. In addition to the area of geographical or spatial influence, temporal influence should also be determined. A geographical information system is a useful tool for this purpose.
-	Cumulative Effects	Cumulative effects (or impact) are changes to the environment that are caused by an action in combination with other past, present and future human actions. The assessment of these effects is called a cumulative effects assessment (CEA) or cumulative impact assessment (CIA).
-	Cut-off date	Date of completion of the census and assets inventory of persons affected by the project. Persons occupying the project area after the cutoff date are not eligible for compensation and/or resettlement assistance. Similarly, fixed assets (such as built structures, crops, fruit trees, and woodlots) established after the date of completion of the assets inventory, or an alternative mutually agreed on date, will not be compensated.
-	Economic Resettlement	Loss of income streams or means of livelihood, resulting from land acquisition or obstructed access to resources (land, water, or forest) resulting from the construction or operation of a project or its associated facilities.
ESIA	Environmental and Social Impact Assessment	Identifies and assesses risks and the impacts associated with the project and provides a series of mitigation measures that when implemented will ensure the project complies with the standards and guidelines it has be evaluated against.
ESMP	Environmental and Social Management Plan	Summarises the client's commitments to address and mitigate risks and impacts identified as part of the Assessment, through avoidance, minimisation, and compensation/offset. This may range from a brief description of routine mitigation measures to a series of more comprehensive management plans (e.g. water management plan, waste management plan, resettlement action plan, indigenous peoples plan, emergency preparedness and response plan, decommissioning plan).
ESMS	Environmental and Social Management System	The ESMS is the overarching environmental, social, health and safety management system which may be applicable at a corporate or Project level. The system is designed to identify, assess and manage risks and impacts in respect to the Project on an ongoing basis.
-	Involuntary resettlement	Resettlement is involuntary when it occurs without the informed consent of the displaced persons or if they give their consent without having the power to refuse resettlement.
IP	Indigenous People	Social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development.
-	Land Acquisition	Land acquisition includes both outright purchases of property and acquisition of access rights, such as easements or rights of way.
-	Legal and regulatory framework	The national legal and institutional framework applicable to the project should be defined. This should also include any additional lender requirements and any international agreements or conventions that may also apply.
-	Livelihood	Refers to the full range of means that individuals, families, and communities utilize to make a living, such as wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.

Acronym	Term	Definition
LRP	Livelihood Restoration Plan	The document in which a project sponsor or other responsible entity specifies the procedures that it will follow and the actions that it will take to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by an investment project. The LRP relates specifically to cases where Project Affected Persons (PAPs) are economically displaced.
-	Physical displacement	Loss of shelter and assets resulting from the compulsory acquisition of land associated with a project that requires the affected person(s) to move to another location.
PAP	Project Affected Persons	Any person who, as a result of the implementation of a project, loses the right to own, use, or otherwise benefit from a built structure, land (residential, agricultural, or pasture), annual or perennial crops and trees, or any other fixed or moveable asset, either in full or in part, permanently or temporarily.
-	Project Description	A project description should be provided as early as possible that describes all project activities that could impact on environmental and social components within the project area of influence. Ideally the project description should be prepared by the project front end engineering team in association with the ESIA team. It should consider all project phases from pre-construction, construction, operation and decommissioning. The project description should be as detailed as possible in order to identify the environmental aspects resulting from project activities.
ARAP	Abbreviated Resettlement Action Plan	The document in which a project sponsor or other responsible entity specifies the procedures that it will follow and the actions that it will take to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by an investment project. The ARAP relates specifically to cases where Project Affected Persons (PAPs) are physically displaced.
-	Resettlement	The settlement of people in a different place.
-	Screening	Categorization of the project should be undertaken depending on the expected severity of project impacts, which determine the level of environmental and social impacts. Categories (ABC) should be established as per IFC Performance Standards.
ToR	Terms of Reference	The ToR provides a guide as to how an environmental and social assessment should be conducted and the level of detail that is required. Normally the ToR is prepared by the responsible environmental authority. In some cases, the ToR may be circulated in draft form for public review and comment before being defined.
-	Vulnerable groups	Those below the poverty line, the landless, the elderly, disabled, women and children, indigenous peoples, ethnic minorities, or other displaced persons who may not be protected through national land compensation legislation.

List of Abbreviations

Acronym	Meaning
AoI	Area of Influence
ARAP	Abbreviated Resettlement Action Plan
DGDC	Dominica Geothermal Development Company Limited
DOMLEC	Dominica Electricity Services Limited
DOWASCO	Dominica Water and Sewerage Company Limited
DSWMC	Dominica Solid Waste Management Corporation
EIA	Environmental Impact Assessment
EHS	Environmental Health and Safety
EPC	Engineer, Procure and Construct
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
GDP	Gross Domestic Product
GoCD	Government of the Commonwealth of Dominica
HSE	Health, Safety and Environment
IFC	International Finance Corporation
kV	Kilovolt
kW	Kilowatt
LRP	Livelihood Restoration Plan
MTPNP	Morne Trois Pitons National Park
MW	Mega Watt
MWe	Mega Watt Electric
PAP	Project Affected Persons
PPE	Personal Protective Equipment
PS	Performance Standard
RPF	Resettlement Policy Framework
SEP	Stakeholder Engagement Plan
SIA	Social Impact Assessment
ToR	Terms of Reference
WB	World Bank
WBG	World Bank Group
WHO	World Health Organisation

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs New Zealand Limited ("Jacobs") is to describe the Environmental and Social Impact Assessment (ESIA) for the Dominica Geothermal Power Project in accordance with the scope of services set out in the contract between Jacobs and the New Zealand Ministry of Foreign Affairs and Trade (the Client). That scope of services, as described in this report, was developed with the Client, the Government of the Commonwealth of Dominica (GoCD) and the Developer (Dominica Geothermal Development Company (DGDC) established and owned by the GoCD).

Jacobs has been contracted by the Client to undertake the conceptual design and overall project definition through their engineering team. In preparing this ESIA report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided. Except as otherwise stated in the ESIA report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced as noted in the ESIA volumes and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

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1. Introduction

1.1 Overview

The ESIA Volume 3: Social Impact Assessment (SIA) assesses how people and communities may be affected as a result of the Project in terms of the way they live, work and interact. The broad objectives of this SIA are to ensure that key potential socio-economic and community impacts have been identified, assessed, mitigated and managed in a constructive manner. Social, economic and biophysical impacts are interrelated. The human environment will be the receptor of impacts such as noise, dust, waste and traffic. These impacts are identified and taken into account in this SIA, but are addressed in detail in the ESIA Volume 2: Environmental Impact Assessment and other Technical Reports located in ESIA Volume 5: Technical Appendices.

This SIA follows the principles defined in the Social Impact Assessment: Guidance for Assessing and Managing the social impact of Projects and, as the Project is considered a private sector led economic development Project, this assessment was carried out to meet the requirements of World Bank Group Performance Standards (described in Section 2).

Social and community impacts have been assessed and identified as potentially significant in relation to resettlement, community health and safety and livelihood restoration. Consideration has also been given to employment impacts. Environmental impacts from construction activities could also have community impacts, however, to avoid double counting of impacts these have been addressed within Volume 2 and are not covered again here.

A draft of the SIA of was issued in September 2017 prior to Hurricane Maria. This SIA has been updated following Hurricane Maria, which devastated the island in September 2017. It was reported that the majority of the island's inhabitants have been affected by the Hurricane. Impacts include loss of homes, business, schools, social infrastructure and basic amenities such as water and electricity. Further discussion on the baseline impacts following Hurricane Maria are presented in Section 4.

1.2 Structure of Volume 3

This ESIA Volume 3: SIA is structured in the following way:

- Section 2 – Legal and Regulatory Framework
- Section 3 – Impact Assessment Methodology
- Section 4 – Social and Economic Baseline
- Section 5 – Stakeholder Engagement
- Section 6 – Social Impact Assessment
- Section 7 – Cultural Heritage
- Section 8 – Mitigation, Monitoring, Enhancement Measures and Residual Impacts
- Section 9 – References

2. Legal and Regulatory Framework

2.1 Introduction

The purpose of this section is to set out the requirements that apply to SIA for the Project. It is important that the Project meets local and internationally accepted environmental and social safeguard standards to ensure that community benefits are maximised and that potential adverse environmental and social impacts are minimised. Relevant national and international requirements are summarised below.

2.2 National Requirements

There are a number of Dominican national policies, laws, regulations and guidelines that guide relevant environmental, social and economic issues (discussed in detail in ESIA Volume 1: Introduction, Section 2). The laws and regulations also provide the relevant instruments for the effective management of land acquisition and proper institutional coordination. These regulations, policies, laws and guidelines identified include the following:

2.2.1 Land Acquisition Act

The Land Acquisition Act, Chapter 53:02 deals with the acquisition of land by the state and clearly outlines procedures in acquiring private lands for state use. The Act covers the following areas:

i. Acquisition of land and abandonment of acquisition
ii. Appointment and powers of Board of Assessment
iii. Determination of Small Claims for Compensation
iv. Provisions Governing Assessment of Compensation
v. Miscellaneous
    a) Absentee owners
    b) Compensation to persons interested in adjacent land
    c) Special provisions as to leases
    d) Persons in possession to be deemed owners
    e) Fees and expenses of Board
    f) Conveyancing etc.
    g) Payment of compensation
    h) Exemption from stamp duty and fees
    i) Limitation of time for making claims
    j) Assaulting or obstructing officer
    k) Saving

The Act includes the determination of how compensation should be determined. The general process of compulsory land acquisition under the Land Acquisition Act, Chapter 53:02 is described below in Figure 2.1.

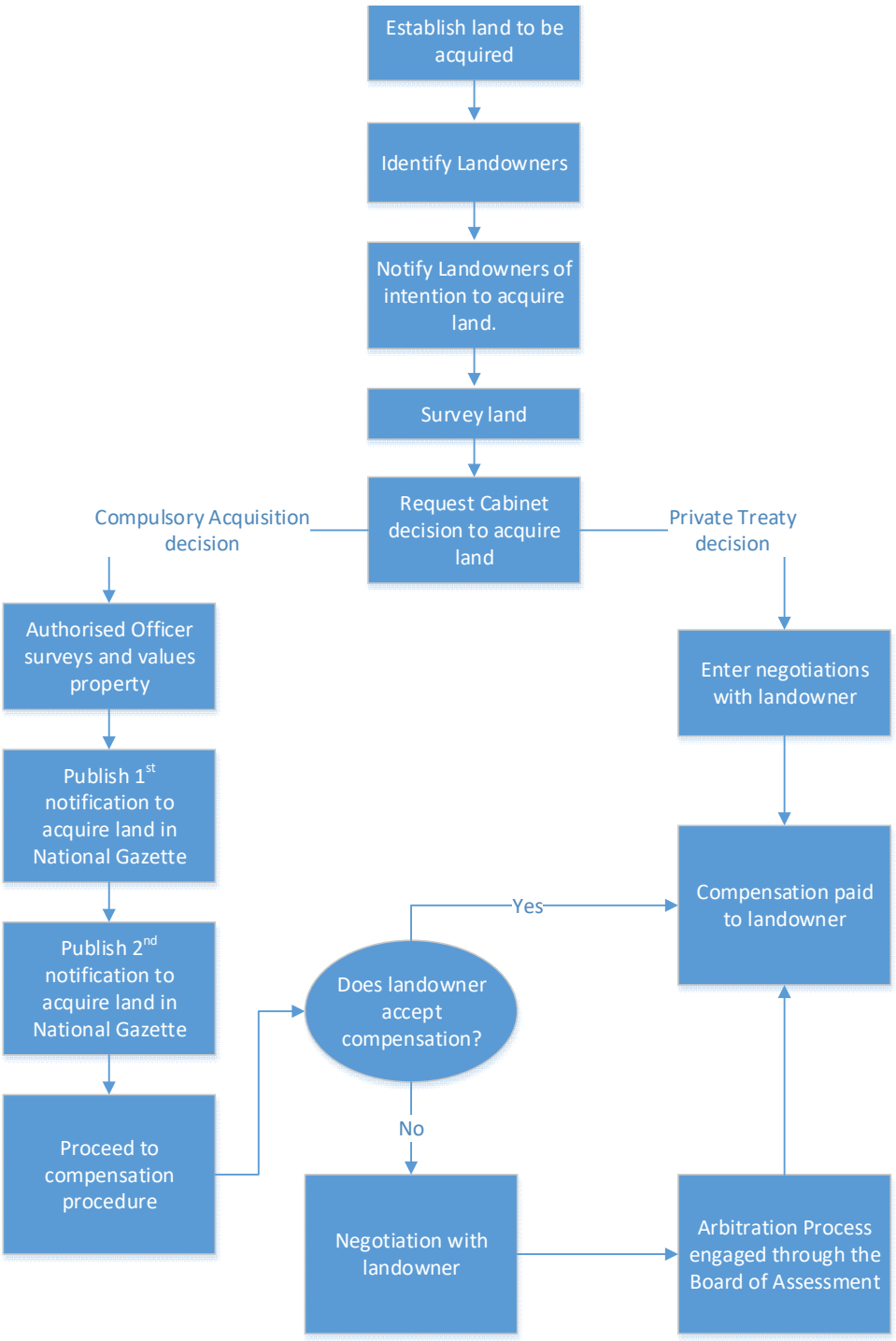

Figure 2.1 : The general process of acquiring land through compulsory acquisition in Dominica.

2.3 International Requirements

2.3.1 World Bank Group Operational Policies

This study was conducted taking into account Dominica's regulations and the requirements of lenders, in this case the World Bank Group (WBG). This includes examination and verification of the project's compliance with WBG's Operational Policies. The applicable policies to this project are: OP4.03 (World Bank Group Performance Standards for Private Sector Activities) and OP4.12 (Involuntary Resettlement). Under OP4.03, the applicable performance standards are:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

PS 7 – Indigenous People does not apply to the Project. People living in the Project area are not categorized as Indigenous People. They are part of the mainstream Dominican society, and do not have any specific economic or cultural activity different from the rest of the society. They participate fully in the socioeconomic life of the society.

2.3.2 OP 4.12- Involuntary Resettlement

According to OP 4.12, involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out. For these reasons, the overall objectives of the Bank's policy on involuntary resettlement are the following:

(a) Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.

(b) Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted
and should have opportunities to participate in planning and implementing resettlement programs.

(c) Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

OP 4.12 covers direct economic and social impacts that both result from Bank-assisted investment projects and are caused by:

(a) the involuntary taking of land resulting in relocation or loss of shelter;

(1) loss of assets or access to assets; or

(2) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or

(3) the involuntary restriction of access9 to legally designated parks and protected areas resulting in adverse

(b) impacts on the livelihoods of the displaced persons.

2.3.3 General and Industry Specific Environmental Health and Safety (EHS) Guidelines

The World Bank Group (WBG) General EHS Guidelines contain information on overall project environmental, health, and safety issues applicable to all industry sectors. These guidelines should be used together with the relevant Industry Sector Guideline(s), which in the case of the Project include:

- Geothermal Power Generation, and
- Electric Power Transmission and Distribution.

Further discussion of General and Industry Specific EHS Guidelines can be found in ESIA Volume 1: Introduction, Section 2.

3. Impact Assessment Methodology

3.1 Introduction

The objective of the SIA is to determine the potential impacts of the Project on social and economic factors that influence the socio-economic well-being of the communities where the Project is proposed. To measure the influence of the Project on these factors, a socio-economic baseline is presented to establish existing characteristics of the community. This is followed by a discussion of the potential positive and negative impacts that could result from implementation of the Project including proposed measures to mitigate any potential negative impacts. The SIA methodology has been completed in accordance with both national and international requirements.

3.2 Baseline Conditions

Baseline data collection refers to the collection of background data in support of the SIA. Ideally baseline data should be collected prior to development of a project, but often this is not possible. Baseline data collection can also occur throughout the life of a project as part of ongoing monitoring of environmental and social conditions.

World Bank (1999) guidance on identification of baseline data states that it *'…describes relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences. Also takes into account current and proposed development activities within the project area but not directly connected to the project. Data should be relevant to decisions about project location, design, operation, or mitigatory measures. The section indicates the accuracy, reliability, and sources of the data.'*

The baseline data was gathered through social baseline studies conducted between November 2016 until March 2018 and supplementary data from earlier Project related studies detailed below. It should be noted that the impacts described in the impact assessment are for those that exist in the 'post-Maria' environment (i.e. impacts on the current baseline).

3.2.1 Previous Studies

The Project benefits from having a wealth of environmental studies data collected for environmental assessments for exploration and drilling phases. To date the following environmental and social studies have been completed:

- Caraïbes Environnement Développement & Coll (2009) Regulatory Impact Assessment on the Initial Environment - Environmental Feasibility Study.
- Caraïbes Environnement Développement & Coll (2011). Stage 1: Exploration Drilling Process – Environmental Impact Assessment.
- Caraïbes Environnement Développement & Coll (2013) Stage 2: Preliminary Environmental Impact Assessment of Geothermal Production and Re-Injection Drilling Wells in Dominica – Environmental Impact Assessment.
- To support the preparation of an ESIA for the exploration phase of the geothermal development, baseline surveys of the social, physical and biological environment within the Roseau Valley were completed between October 2013 and April 2015. These were summarised in the following reports (collectively referred to as the 'Baseline Study'):
    - Caraïbes Environnement Développement & Coll (2015a). Initial environmental status of the Roseau Valley in Dominica, planned for development of geothermal electricity production. Final report, May 2015. Section 3 Biodiversity / Terrestrial Flora and Fauna.

- Caraïbes Environnement Développement & Coll (2015b). Initial environmental status of the Roseau Valley in Dominica, planned for development of geothermal electricity production. Final summary report.

As part of the ESIA Terms of Reference (ToR), (Jacobs, 2017) a review of these previous studies was carried out. The findings of this review were presented along with any further baseline data collection proposed in the ToR. In addition, a review of the situational analysis prepared by the WB was carried out.

3.3 Aspects Identification

The key E&S aspects considered in detail in this SIA have been determined from the ESIA Terms of Reference (ToR) (Jacobs, 2017). As a result of the scoping assessment the following baseline socio-economic topics are covered in this SIA:

- Demographic Overview;
- Land Use;
- Religion;
- Ethnicity and Culture;
- Gender Relations;
- Indigenous People;
- Ecosystem Services;
- Economic Profile;
- Educational Profile;
- Health Profile;
- Access to Community Services and Infrastructure; and
- Quality of Life.

The following key issues have been technically assessed in this SIA:

- Physical Displacement/Resettlement as a result of the Project;
- Economic Displacement and Livelihood Impacts, including those to Ecosystem Services;
- Employment benefits; and
- Economic benefits.

3.4 Impact Identification

The impact assessment predicts and assesses the Project's likely positive and negative impacts, in quantitative terms to the extent possible. For each of the environmental aspects listed above, the assessment identifies impacts and reports the likely significant environmental impacts. An ESIA will always contain a degree of subjectivity, as it is based on the value judgment of various specialists and ESIA practitioners. The evaluation of significance is thus contingent upon values, professional judgement, and dependent upon the environmental context. Ultimately, impact significance involves a process of determining the acceptability of a predicted impact.

In broad terms, impact significance can be characterised as the product of the degree of change predicted (the magnitude of impact) and the value of the receptor/resource that is subjected to that change (sensitivity of receptor). For each impact the likely magnitude of the impact and the sensitivity of the receptor are defined. Generic criteria for the definition of magnitude and sensitivity are summarised below.

3.4.1 Direct vs Indirect Impacts

A direct impact, or first order impact, is any change to the environment, whether adverse or beneficial, wholly or partially, resulting directly from an environmental aspect. An indirect impact may affect an environmental, social or economic component through a second order impact resulting from a direct impact.

3.4.2 Magnitude Criteria

The assessment of impact magnitude is undertaken by categorising identified impacts of the Project as beneficial or adverse. Then impacts are categorised as 'major', 'moderate', 'minor' or 'negligible' based on consideration of parameters such as:

- Duration of the impact – ranging from 'well into operation' to 'temporary with no detectable impact'.
- Spatial extent of the impact – for instance, within the site boundary, within district, regionally, nationally, and internationally.
- Reversibility – ranging from 'permanent thus requiring significant intervention to return to baseline' to 'no change'.
- Likelihood – ranging from 'occurring regularly under typical conditions' to 'unlikely to occur'.
- Compliance with legal standards and established professional criteria – ranging from 'substantially exceeds national standards or international guidance' to 'meets the standards' (i.e. impacts are not predicted to exceed the relevant standards) presents generic criteria for determining impact magnitude (for adverse impacts). Each detailed assessment will define impact magnitude in relation to its environmental or social aspect.
- Any other impact characteristics of relevance.

Table 3.1 below presents generic criteria for determining impact magnitude (for adverse impacts). Each detailed assessment will define impact magnitude in relation to its environmental or social aspect.

Table 3.1 : Magnitude criteria

Magnitude (beneficial or adverse)	Definition (considers likelihood, duration, number of people affected, spatial extent and local benefit sharing)
Major	A highly likely impact that would have implications beyond the Project's life affecting the wellbeing of many people across a broad cross-section of the population and affecting various elements of the local communities', or workers', resilience.
Moderate	A likely impact that continues over a number of years throughout the Project's life and affects the wellbeing of specific groups of people and affecting specific elements of the local communities', or workers', resilience.
Minor	A potential impact that occurs periodically or over the short term throughout the life of the Project affecting the wellbeing of a small number of people and with little effect on the local communities', or workers', resilience.
Negligible	A potential impact that is very short lived so that the socio-economic baseline remains largely consistent and there is no detectable effect on the wellbeing of people or the local communities' or workers', resilience.

3.4.3 Sensitivity Criteria

The significance of an impact has been determined by the interaction between its magnitude, and the sensitivity of receptors affected. Professional judgement has been used by appropriately qualified social scientists when assigning significance. The use of these two concepts for this assessment is outlined below.

The sensitivity of receptors has been estimated through consideration of their socio-economic vulnerability, measured by their capacity to cope with social impacts that affect their access to or control over additional or alternative social resources of a similar nature, ultimately affecting their wellbeing. Sensitive or vulnerable receptors are generally considered to have less means to absorb adverse changes, or to replicate beneficial changes to their resource base than non-sensitive or non-vulnerable receptors.

When considering sensitivity, the type of resources in question varies between receptors. For example, a community's vulnerability has generally been measured in terms of its resilience to loss of community facilities, whereas an individual's vulnerability has generally been considered in relation to their resilience to deprivation and loss of livelihood assets or opportunities (such as jobs, productive land or natural resources). Impacts that increase impoverishment risks contribute to vulnerability. Impoverishment risks include landlessness, joblessness, homelessness, marginalisation, increased morbidity and mortality, food insecurity, loss of access to common property resources and social disarticulation, which are likely to have increased post-Hurricane Maria. Table 3.2 below presents the guideline criteria that have been used to categorise the sensitivity of receptors.

Table 3.2 : Sensitivity criteria

Category	Description
High	An already vulnerable social receptor with very little capacity and means to absorb proposed changes or with very little access to alternative similar sites or services.
Medium	An already vulnerable social receptor with limited capacity and means to absorb proposed changes or with little access to alternative similar sites or services.
Low	A non-vulnerable social receptor with some capacity and means to absorb proposed changes and with some access to alternative similar sites or services.
Negligible	A non-vulnerable social receptor with plentiful capacity and means to absorb proposed changes and with good access to alternative similar sites or services.

3.4.4 Impact Evaluation

The determination of impact significance involves making a judgment about the importance of project impacts. This is typically done at two levels:

- The significance of project impacts factoring in mitigation inherently within the design of the project; and
- The significance of project impacts following the implementation of additional mitigation measures, referred to as residual impact.

Likely impacts are evaluated taking into account the interaction between the magnitude and sensitivity criteria as presented in the impact evaluation matrix in the table below.

Table 3.3 : Impact Evaluation Scale

		Magnitude			
		Major	**Moderate**	**Minor**	**Negligible**
Sensitivity	**High**	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor	Negligible
	Low	Moderate	Minor	Negligible	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible

3.5 Mitigation

Mitigation measures are actions taken to avoid or minimise negative environmental or social impacts. Mitigation includes those embedded within design (as already considered as part of the impact evaluation) and any additional mitigation required thereafter. Additional mitigation will be implemented to reduce significance impacts to an acceptable level, this is referred to as the residual impact. The mitigation hierarchy should be followed: prevent or avoid, minimise, restore or remedy, offset, compensate. Mitigation measures should be clearly identified and linked to environmental and social management plans.

3.6 Monitoring

Monitoring is not linked to the impact evaluation but is an important component of the ESIA and allows for evaluation of the effectiveness of mitigation measures. Monitoring and follow-up actions should be completed to:

- Continue the collection of data throughout construction, operation and later decommissioning.
- Evaluate the success of mitigation measures, or compliance with project standards or requirements.
- Assess whether there are impacts occurring that were not previously predicted.
- In some cases, it may be appropriate to involve local communities in monitoring efforts through participatory monitoring. In all cases, the collection of monitoring data and the dissemination of monitoring results should be transparent and made available to interested project stakeholders.

3.7 Residual Impacts

Those impacts that remain once mitigation has been put in place will be described as residual impacts, using Table 3.3 set out above.

3.8 Cumulative Impacts

The assessment of cumulative impacts will consider the combination of multiple impacts that may result when:

- The Project is considered alongside the existing facilities.
- The Project is alongside other existing or proposed projects in the same geographic area or similar development timetable.
- Impacts identified in different environmental and social aspects of the ESIA combine to affect a specific receptor.

The assessment of cumulative impacts will identify where particular resources or receptors would experience significant adverse or beneficial impacts as a result of a combination of projects (inter-project cumulative impacts). In order to determine the full combined impact of the development, potential impacts during construction and operational phases have been assessed where relevant.

4. Social and Economic Baseline

4.1 Introduction

The Project's socio-economic baseline includes information from:

- Previous Environmental Impact Assessments (EIA) (2009 and 2011) (see Section 2.1);
- A Gap Analysis carried out by the WB in early 2013;
- A subsequent ESIA social baseline study carried out by Jacobs and the Dominica Geothermal Development Company Limited (DGDC) between 2016 and 2017;
- Post Disaster Needs Assessment Hurricane Maria, September 18, 2017, carried out by the Government of the Commonwealth of Dominica.

Public meetings and one to one engagements were conducted for the drilling phase of the project between 2012 and 2015. Public meetings for the current phase of the Project which includes development of the Power Plant and reinjection pipeline route have been held during 2016 – 2017, focused around the three communities of Laudat, Trafalgar and Wotten-Waven. Focus group meetings were held with specific vendor and women's groups in Laudat, Trafalgar and Wotten-Waven in March 2018, following the devastation of the island by Hurricane Maria. Baseline data collected included approximately 35 surveys in the affected community and data collected from focus groups responses. Further details of consultation conducted for the Project are included in Section 5.

4.2 General Setting

The Commonwealth of Dominica is a small island developing state in the Caribbean Sea with a population of approximately 72,000 people and a land area of approximately 750 km^2. The island is the largest and most northerly of the Windward Islands in the Lesser Antilles, lying between Guadeloupe and Martinique. The island measures 40 km by 22 km, extending from 15º10'N-15º40'N and 61º15'W-61º30'W (Caribbean Community Climate Change Centre, 2011). An estimated 60% of the land is classified as the Morne Trois Piton National Park (MTPNP) World Heritage site by UNESCO, due to its rich biodiversity. The capital Roseau is located to the south-west of the island and has a population of around 15,000 people (Figure 4.1).

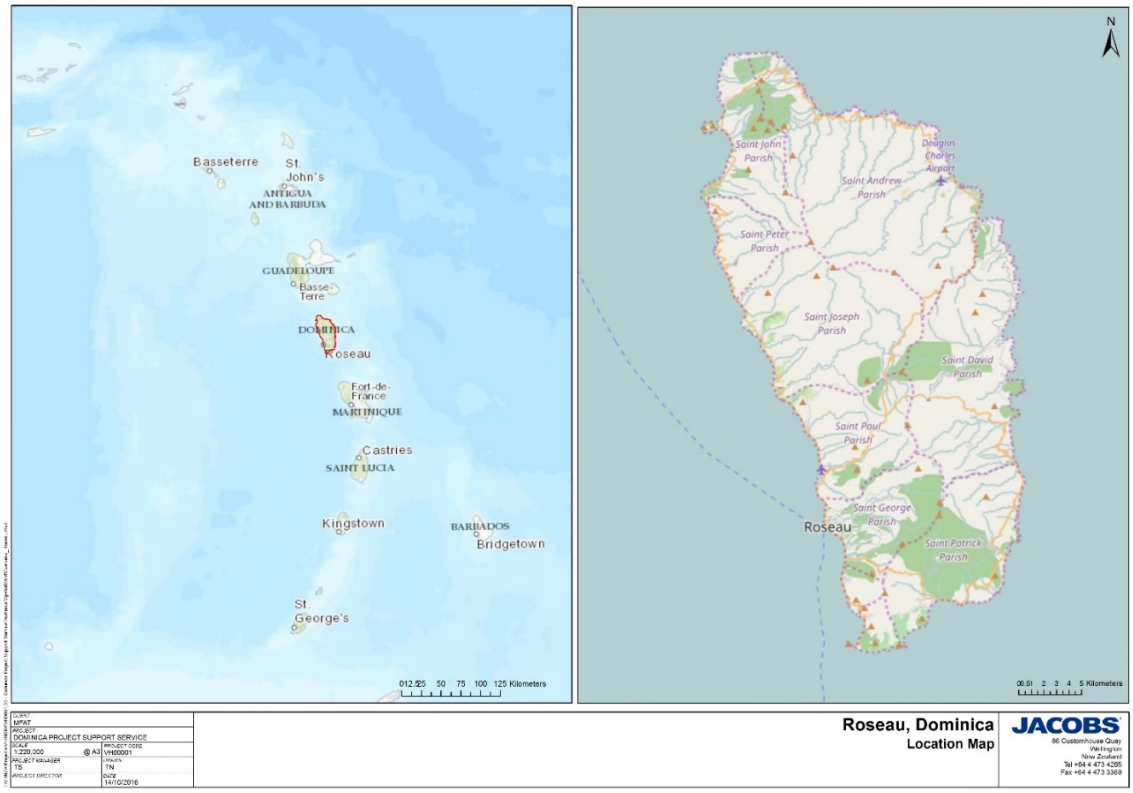

Figure 4.1 : Dominica's location in the Caribbean

The Roseau Valley lies inland from the coast, bordering the capital city of Roseau. An overview of the Roseau Valley is provided in Figure 4.2.

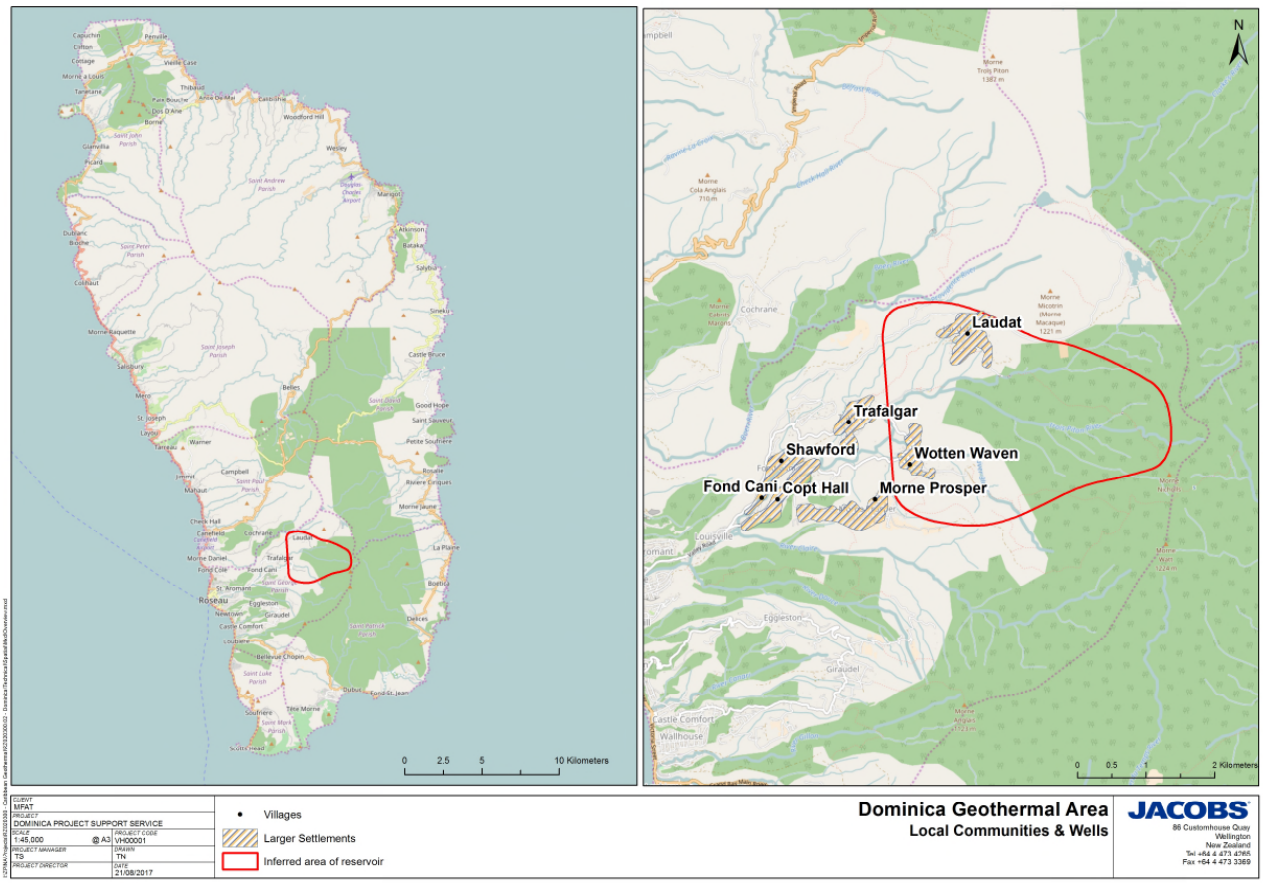

Figure 4.2 : Location of Roseau Valley (Site of proposed Geothermal Power Plant)

The proposed Project is located in the Roseau Valley in the Wotten Waven Geothermal System. Three well pads will be used for the Project: WW-P1, WW-01 and WW-R1. WW-01 is located near Wotten Waven, reinjection site WW-R1 is near the village of Trafalgar, and WW-P1 is located in Laudat.

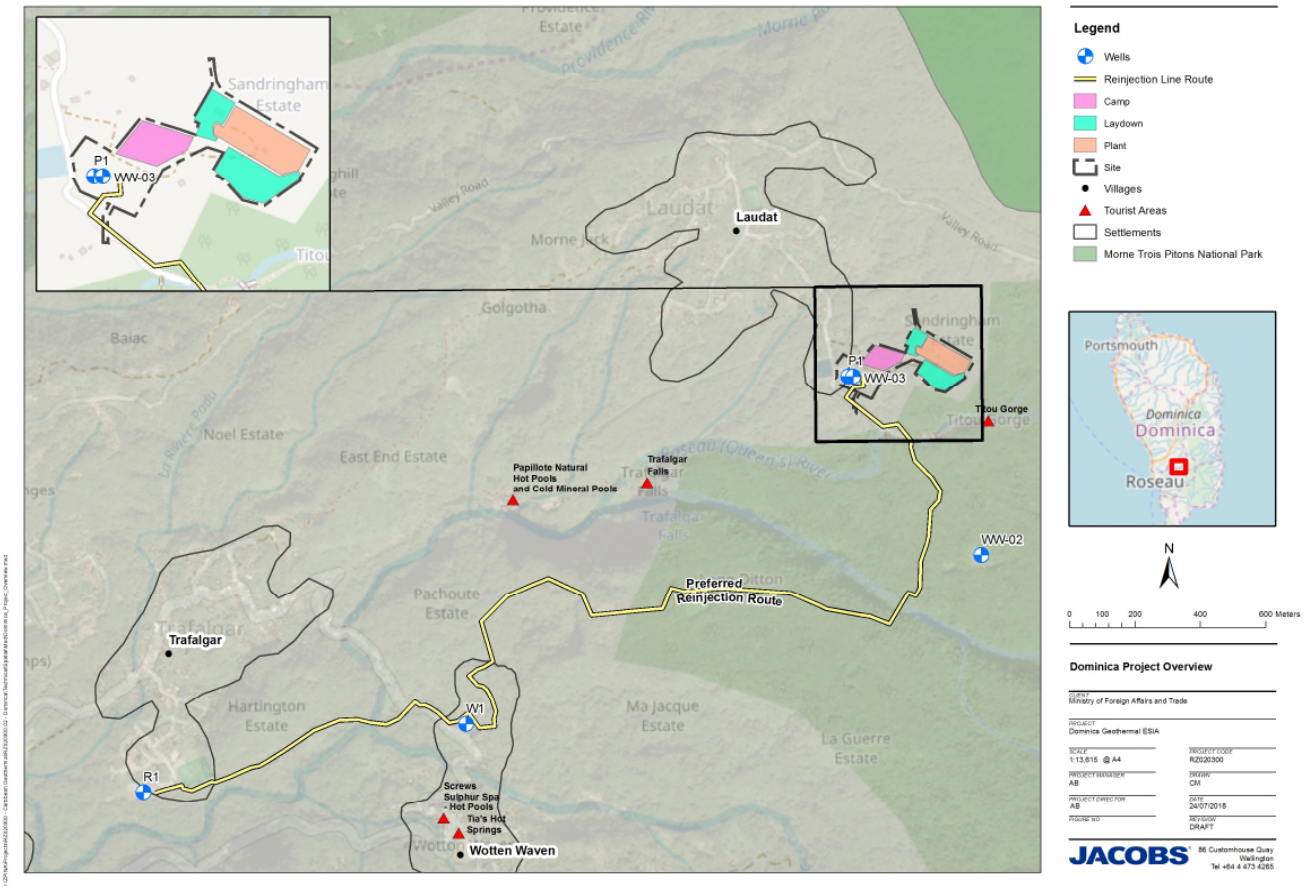

Figure 4.3 : Project Overview

The power plant is proposed to be located in the village of Laudat. Three well pads will be used for the Project with a production well and reinjection well for condensate at Laudat by the power plant and two further reinjection wells at Wotten Waven and Trafalgar. The preferred injection line route will be finalised in close co-ordination with process engineering, mechanical, geotechnical and civil engineering design disciplines, along with the Government, Land and Survey Division and environmental and social scientists. An overview of the Project area is provided in and Figure 4.5.

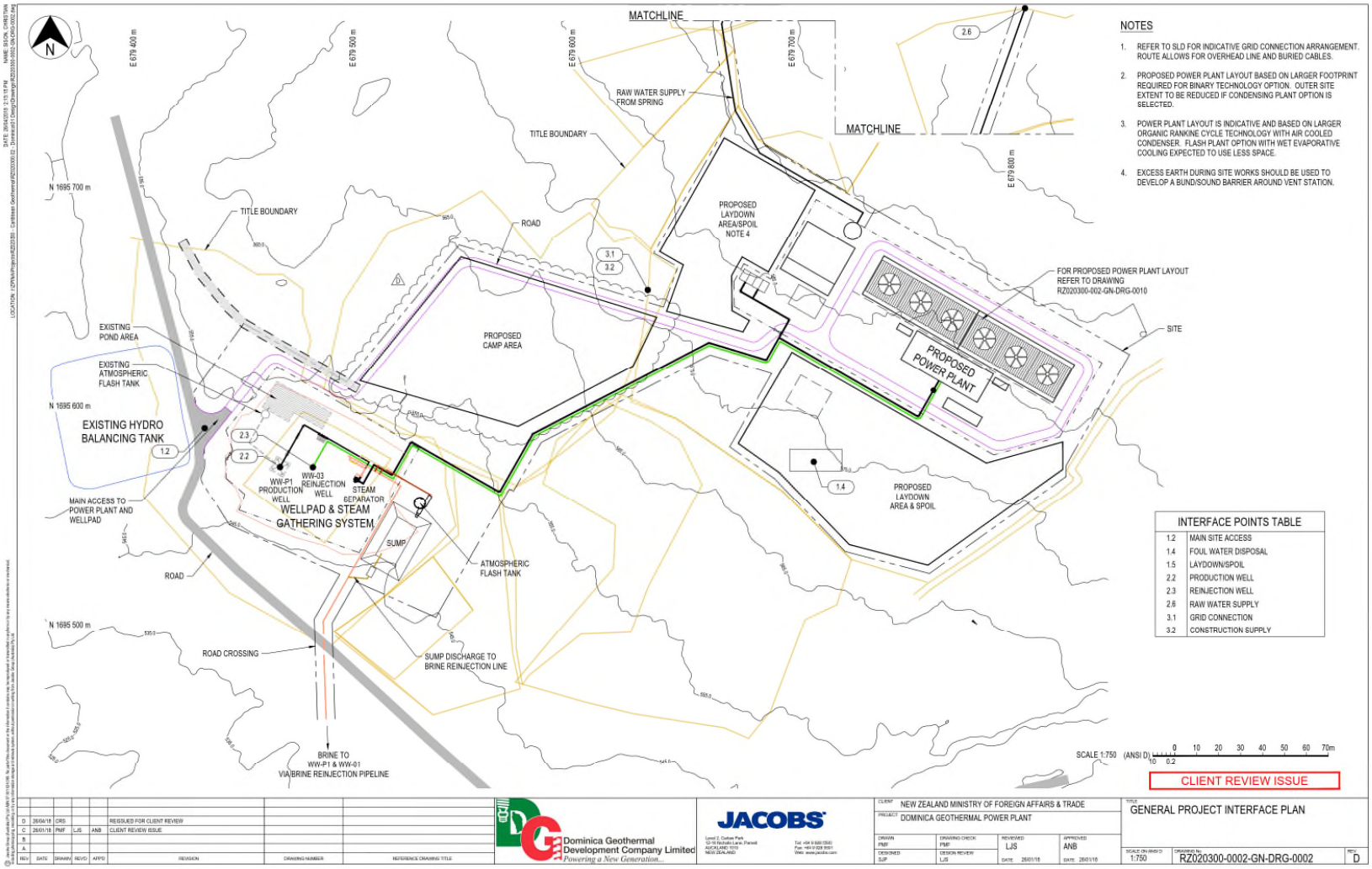

Figure 4.4 : Proposed Power Plant Site, Worker's Camp and Production Steamfield Layout

The area proposed for Project development is generally sparsely populated, characterised by some agroforestry and naturally vegetated areas. The proposed re-injection pipeline route is in generally hilly terrain, and is unlikely to be heavily populated. Brief descriptions of the main locations of Project infrastructure are as follows:

- Power plant comprising 2 x 3.5 MW units (either single flash steam condensing cycle or organic Rankine cycle units (binary turbine), which will be adjacent to wells WW-P1 and WW-03. The binary power plants may use wet cooling or dry cooling;
- Production well WW-P1 – The existing geothermal production well at Laudat is indicated to have potential to generate 6 to 9 MW and will be the sole production well for the project;
- Reinjection wells WW-R1 (located in Trafalgar) and WW-01 (located in Wotten Waven) – The used geothermal fluid (brine and possibly some steam condensate) produced from production well WW-P1 would be disposed of into reinjection wells WW-R1 and WW-01 via a 250 to 300 mm diameter reinjection pipeline of up to 3.5 km in length;
- Steamfield infrastructure including two phase piping, steam separator, atmospheric flash tank, brine collection and disposal system, condensate collection and disposal system, pressure relief system, storage sump and rock muffler;
- A Worker's Camp will be constructed during the construction phase will be located on site (see Figure 4.4), which will house an estimated 50 workers and will contain:
  - Canteen and showers with hot water facilities;
  - Sleeping quarters;
  - Recreational/games room;
  - Potable water supplies from either a tanker-supplied storage tank, or a dedicated treatment plant; and
  - Packaged sewage system treatment plant.
- Supporting infrastructure including existing well pads, turbine building, primary and ancillary equipment, cooling system, and water supply; and
- 11 kV interconnection to the DOMLEC electricity grid at the power plant site.

Figure 4.5 : Reinjection Site (WW-R1) and Surrounding Area (Caraïbes Environnement Développement & Coll , 2013)

4.3 Project Area of Influence

Within the Roseau Valley, three main communities of Trafalgar, Wotten Waven and Laudat were considered as the primary area of influence (Aol) for this SIA because they were in closest proximity to the proposed Project and represent the main communities that to would be likely to be impacted by any employment, resettlement, community health and safety issues. All of these fall within the Roseau Valley and data from the Roseau Valley itself is utilised where appropriate and when more detailed data for each community is not available. Figure 4.5 shows the location of Trafalgar, Wotten Waven and Laudat**.**

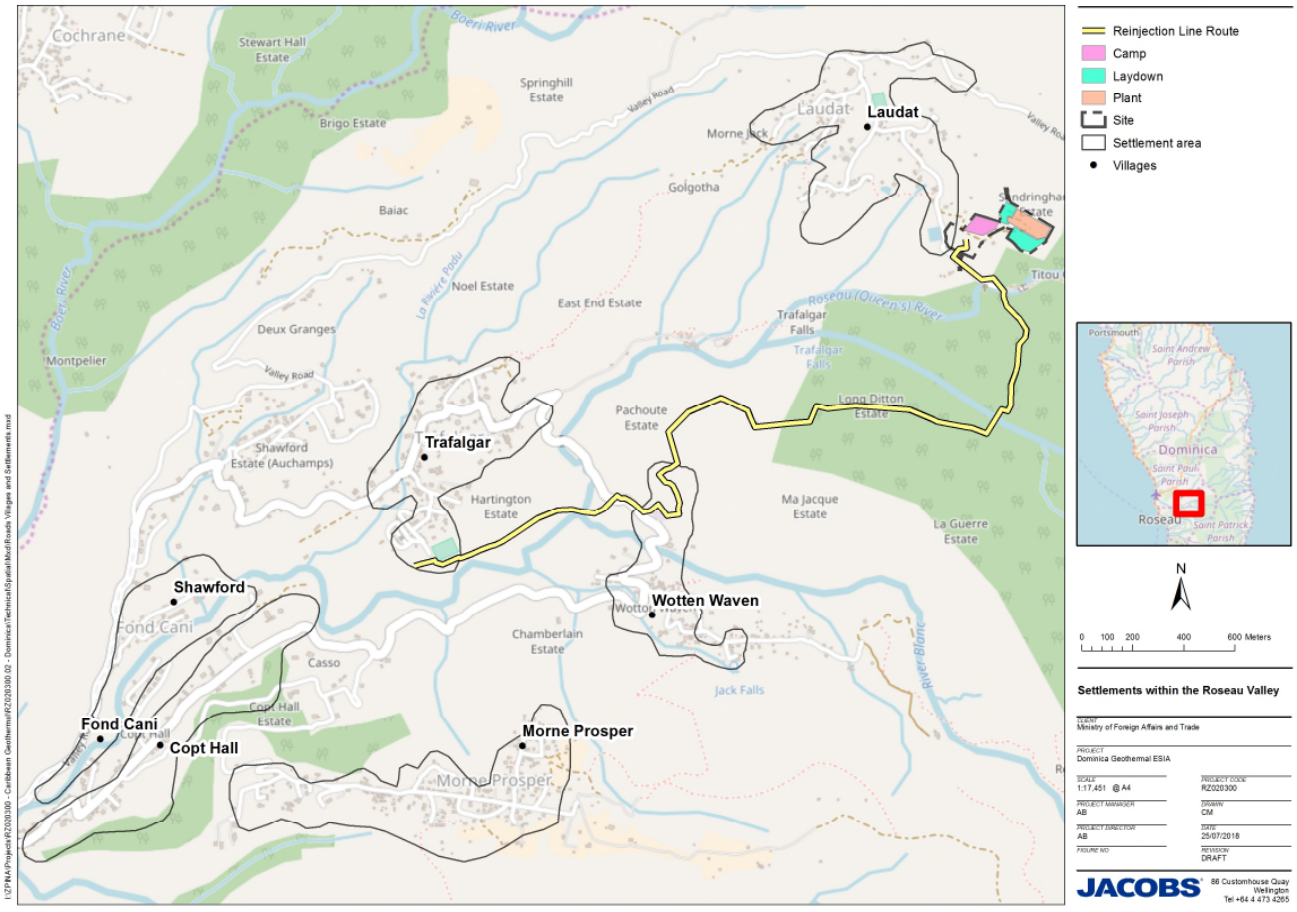

Figure 4.6 : Settlements within the Roseau Valley

4.3.1 Trafalgar

Trafalgar is located in the eastern portion of the Roseau Valley. The bulk of the population (959) in the valley reside in this area and it includes the most residentially developed of the three affected areas. The area is characterised by brightly coloured concrete houses and includes a health centre and a primary school. At the bottom of the valley, the Trafalgar area is used for agriculture including vegetables, herbs and fruit orchards. Trafalgar Falls is also a tourist destination. The community generally has pride in their natural resources and expressed some mild complaints about the increased rate of rust on metal structures in the community from the steam/sulphur in the area.

Figure 4.7 : Trafalgar Ecotourism Business (left) (Jacobs, 2017) and Wotten Waven Community (left) (Source: Jacobs, 2017)

4.3.2 Wotten Waven

Wotten Waven is well known for its natural hot sulphur springs and is located in a steep, inaccessible area. The wider area surrounding Wotten Waven area is characterised by agriculture including vegetables, herbs and fruit orchards. The area also includes some residences (population is 313), a health centre and a primary school. Since the 1990s there has been a considerable development in tourism services in the Roseau Valley. This is centred on hiking and the hot sulphur water spas in Wotten Waven.

4.3.3 Laudat

Laudat is a small village nestled between 3 mountains: Morne Watt, Morne Micotrine, and Morne Trois Pitons. Laudat, contains a sector of rainforest where numerous trees are felled for economic development. Laudat also includes a small population of 321, a health centre and a primary school.

Figure 4.8 : Typical Laudat Household (left) (Source: Jacobs, 2017)

4.4 Land Use and Tenure

4.4.1 Dominica Overview

The territory of Dominica is estimated to be 74,851 hectares. The Physical Planning Department estimates that approximately 53% of the land is covered by forests or protected areas, 34% is used for agriculture; 7% for construction and 6% is classified as wasteland (Jacobs, 2017).

Urban development in Dominica is concentrated on the narrow coastal plain extending from Roseau. The capital is situated on the oceanfront around the Roseau River. Its industrial and commercial activity zones are located mainly to the north on the way to Canefield Airport (a private airport). Urban expansion is taking place along the coast and tends to form continuous urban stretches between the steep foothills and the sea. Secondary urban areas are located just behind the coastline, infiltrating the secondary valleys that are perpendicular to the sea and parallel to each other. Most of the houses observed on the roads to the Roseau Valley were built recently. A trend of the subdivision of large agricultural plots for individual residential developments was also observed. There are no official records of house prices in Dominica. However, based on some property listings, two to three-bedroom houses can be bought for an average price of US $500,000, depending on the location, area, quality of construction materials and other factors (Global Property Guide Website, 2017).

4.4.2 The Roseau Valley

The Roseau Valley (about 1,500 hectares) mainly consists of forest and plantation. The eastern part of the valley tends to be agricultural land (including Wotten Waven and Laudat). The urban areas in the Roseau Valley are particularly concentrated at the entrance to the valley and in the eastern part of the valley. Also see Section 3.7, ESIA Volume 2: EIA for further details of the baseline of the landscape of Dominica.

Eight urban communities exist in the Roseau Valley, organised into independent urban areas: Laudat, Morne Prosper (at the Southern boundary of the study area), Wotten Waven, Trafalgar-Shawford, Fond Canie, Copt Hall, Louisville and Silver Lake. Each urban area is organised around a main road with houses distributed along the streets directly leading off. In many cases, well-kept gardens can be seen. An example of a property within Laudat is shown below in Figure 4.8.

The roads throughout the Roseau Valley are generally narrow, cutting through the districts (for further details of the road network reference should be made to ESIA Volume 2: EIA, Section 3.14 – Traffic). Tourist accommodation is scattered throughout the valley, notably in Wotten Waven. The urban areas are not scattered sporadically throughout the Roseau Valley and the houses are not aligned but rather distributed between forests, river and roads with varying orientations. There are local shops at crossroads and some informal dwellings (sheet metal and wooden cabins) that may not be properly permitted are regularly observed.

Figure 4.9 : Example property in Laudat (source: Jacobs, 2016)

4.4.3 Land Tenure in the Project Vicinity

Drilling Phase

During the exploration drilling campaign the Government acquired four plots of land through compulsory acquisition to be used as well pads and leased one:

- Two plots of land for two exploratory wells, WW-01 in Wotten Waven and WW-03 in Laudat. Production well WW-P1 is also located on WW-03;
- Two plots of land (same owner) for one reinjection well WW-R1 in Trafalgar; and
- One plot was leased for WW-02 in Laudat.

No households were physically displaced and a review of the acquisition and resettlement process and subsequent action plan has been developed as part of this ESIA process. The surveys conducted with each property owner showed that two of the property owners are deceased, one is an operating business parcel and the last is an unutilised plot owned by a family. Table 4.1 below provides a breakdown of the affected properties.

Table 4.1 : Properties Affected During the Drilling Phase

Resource	WW-01	WW-02	WW-03	WW-R1
Land owner	Parcel 1	Parcel 2	Parcel 3	Parcel 4 and Parcel 5
Lot Size	1.06 acres	1 acre (leased)	3.852 acres	Two lots measuring 3.958 and 4.145 acres

Resource	WW-01	WW-02	WW-03	WW-R1
Current Ownership/Land Arrangements	Acquired via compulsory acquisition by the Government.	Leased from the owner since 2011.	Acquired via compulsory acquisition by the Government.	Acquired via compulsory acquisition by the Government.
Land Use prior to Drilling Phase	Unoccupied.	Business.	Unoccupied.	Unoccupied.

Landowners in the Project Vicinity

A total of 88 properties were identified from aerial images within 200 m of the power plant and reinjection pipeline route (Figures 4.10 and 4.11). As these properties were identified from aerial imagery, it is not known whether they are occupied. There are seven private property owners for parcels that are directly adjacent to and occupying the Power Plant site and laydown area. As a minimum only two parcels of land are required for the power plant site and laydown area, with potential easements for water pipelines required form two other parcels. Six to nine potentially affected parcels of land have been identified for the development of the reinjection pipeline route. It should be noted that the Project only requires sufficient land for a pipeline corridor (maximum width being 10m) for the reinjection line. The final number of parcels of land and the location of the reinjection line will be confirmed as part of detailed design process. DGDC is currently finalising land acquisition needs for government purchase for the power plant and reinjection pipeline route. All Project components and associated properties identified for future negotiations shall be completed in accordance with the Abbreviated Resettlement Action Plan (ARAP included in Volume 5 of this ESIA – Technical Appendices.

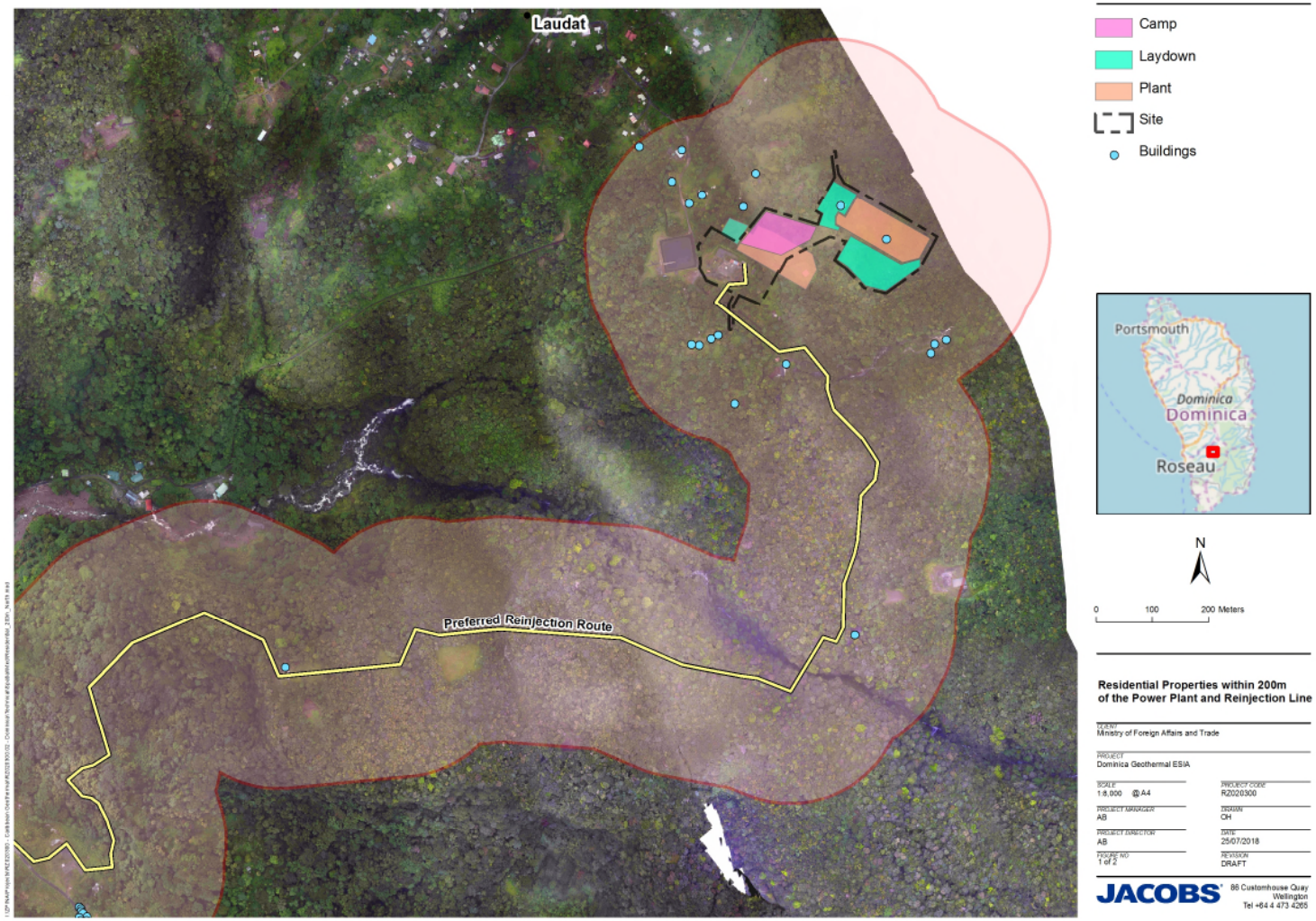

Figure 4.10 : Buildings within 200 m of the power plant and reinjection pipeline (northern end)

Figure 4.11 : Buildings within 200 m of reinjection pipeline (southern end)

4.5 Demographic Overview

According to the Population and Housing Census of 2011, Dominica's population was 71,293 (Commonwealth of Dominica Central Statistical Office, 2011). Between 1991 and 2001, the population of the main townships of Dominica declined, including within the capital Roseau. The population of Dominica shows little increase in general, due to the exodus of people to other countries such as the more prosperous West Indies islands, the United States, the United Kingdom and Canada.

According to the CIA World Factbook the population age stratification consists of the following (shown in Figure 4.11) (CIA World Factbook Website, 2018):

- 0-14 years: 21.72% (male 8,210/female 7,843);
- 15-24 years: 15.14% (male 5,758/female 5,428);
- 25-54 years: 42.2% (male 15,809/female 15,372);
- 55-64 years: 9.81% (male 3,860/female 3,387); and
- 65 years and over: 11.14% (male 3,679/female 4,551) (2017 est.)

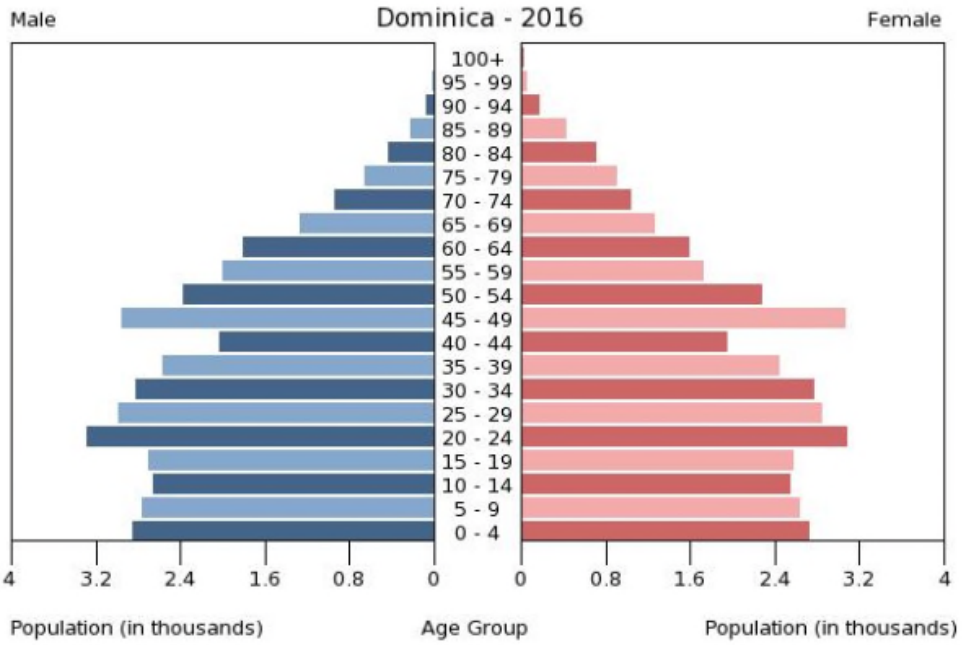

Figure 4.12 : Age Breakdown in Dominica 2016 (Source: Central Intelligence Agency World Factbook Website (2018))

Approximately 1,800 people live in the Roseau Valley, of which nearly 1,000 live in Trafalgar and Shawford, and the remaining in the hamlets of Wotten Waven/Casseau, Copthall, and Laudat. According to the 2011 census, the Roseau Valley gained 500 inhabitants between 2001 and 2011, i.e. a substantial increase of 32% (Commonwealth of Dominica Central Statistical Office, 2011). According to the Central Statistical Office, average household size in the Roseau Valley is 2.7. Post Hurricane-Maria, the demographics of the area have changed, as people move to the larger cities or outside of the country following the loss of their homes, infrastructure and employment. The demographics may have also altered where younger generations may have moved away from the smaller towns and the country to seek opportunities elsewhere. Post-Hurricane Maria, it is understood that many Dominicans have emigrated to other countries for work, thus splitting up families. This may make many households more susceptible to vulnerability in the future.

4.6 Religion

Religion is important aspect of life for many Dominicans: the majority consider themselves as Catholic (61.4%); 7-8% of the population practice other types of Christianity; 7% are not religious; 6% of the population are 7th day Adventists; 5% Pentecostal; 4% Baptist; 3% Methodist; and approximately 1-3% identify as Rastafarian, Church of God, or other religions. There are several churches in the Roseau Valley representing various religions. They are well-attended and play an important role in the island's social life.

4.7 Ethnicity and Language

The great majority of the population is of African descent. English is the official language and is understood by everyone, but due to historical French influence, a French-based Creole language is widely spoken. The island is also the home of the last remaining indigenous population of the West Indies – the Caribs – who number 3,000, but are located an estimated 15 km north-east (the Carib Territory) from the Project site.

Dominica is marked by the Creole culture: 80% of the population speak Creole despite English remaining the official language. The valley enjoys dual English and French-speaking heritage. The current villages correspond to small settlements started by the French colonists as per the December 2013 field surveys.

4.8 Gender

Dominica's population is 49% women and 51% male. Women represent 39% of head of households in Dominica. In addition to their role in household leadership, women continue logging an average of 16.14 hours per week in unpaid care work, which is more than half of the time spent by men (7 hours). Female unemployment is slightly higher than male unemployment, with 2,950 unemployed females to 2,774 males pre-Hurricane Maria. As of 2016, there were more men than women in the formal labour force, 70.6% male to 59.5% female. There is a gender division of labour in Dominica, with women overrepresented in the services sector (both government and commercial).

The breakdown of the population by gender in the Roseau Valley is similar to national averages (48% of females and 52% of males, compared to 49% and 51% respectively for Dominica as a whole). There are, nevertheless, a few differences in certain communities such as a slightly higher proportion of females in Copthall (52%) and fewer at Wotten Waven (44%).

Hurricane Maria has exacerbated the challenges the country faces in terms of gender equality. These challenges include, but are not limited to, access to resources for women farmers, access to health care for women and men, increasing levels of gender based violence (GBV) and economic empowerment for women, especially those in lower socio-economic sectors.

In addition, per the 2018 focus group discussions conducted for the Project post Hurricane Maria, women reported effects on farming, damages to houses and roofs; unemployment and loss of business, and general shock within the community. When asked about priority needs 'post-Maria'. the responses were related to:

- Rehabilitation of their houses;
- Restoring basic livelihood;
- Road repairs; and
- Counselling for people who are still traumatized.

4.9 Indigenous People

According to the WB Performance Standard 7, Indigenous Peoples are defined as social groups with identities that are distinct from mainstream groups. As such, they may be more vulnerable to the adverse impacts associated with project development and their needs must be carefully considered and protected accordingly.

There are no indigenous communities located in the geothermal Project area of influence, with the nearest community being an estimated 15 km north-east (the Carib Territory). Therefore, impacts upon indigenous communities are not considered relevant and have been screened out of the ESIA.

4.10 Ecosystem Services

Ecosystem services are defined by the WB/International Finance Corporation (IFC) (2012) as the benefits that people, including businesses, derive from ecosystems. They are organised into four types: (1) provisioning services (the products people obtain from ecosystems); (2) regulating services (the benefits people obtain from the regulation of ecosystem processes); (3) cultural services (the nonmaterial benefits people obtain from ecosystems); and (4) supporting services (the natural processes that maintain the other services). These would be relevant to the Project in terms ecotourism including thermal spas, medicinal plants, handicrafts, and water related resources in the Trafalgar and Wotten Waven areas. Access to ecosystem services may have been affected by Hurricane-Maria. Much of the area has been destroyed and lands which would have previously been accessible are now reportedly covered in fallen trees, shrubs and bushes, making access challenging.

4.11 Economic Profile

Gross Domestic Product (GDP) estimated in 2017 (pre-Hurricane Maria) was 851 million dollars according to the CIA World Factbook. The economy in Dominica used to be primarily driven by agriculture, but in recent years shifted towards tourism as the Government promoted Dominica as a tourist destination. The income of the residents of Trafalgar, Wotten Waven and Laudat was primarily derived from agriculture, which is comprised of family-based farming for both local consumption and commercial purposes, and tourism. In 2016, it was reported that most of the Roseau Valley residents have several jobs, including employment in the town of Roseau. A breakdown of historic occupations in the Roseau Valley is provided in Figure 4.13 below as recorded in the Caraïbes Environnement Développement & Coll, 2013 report. Figure 4.14 below also shows gender equality indicators for labour across the various sectors.

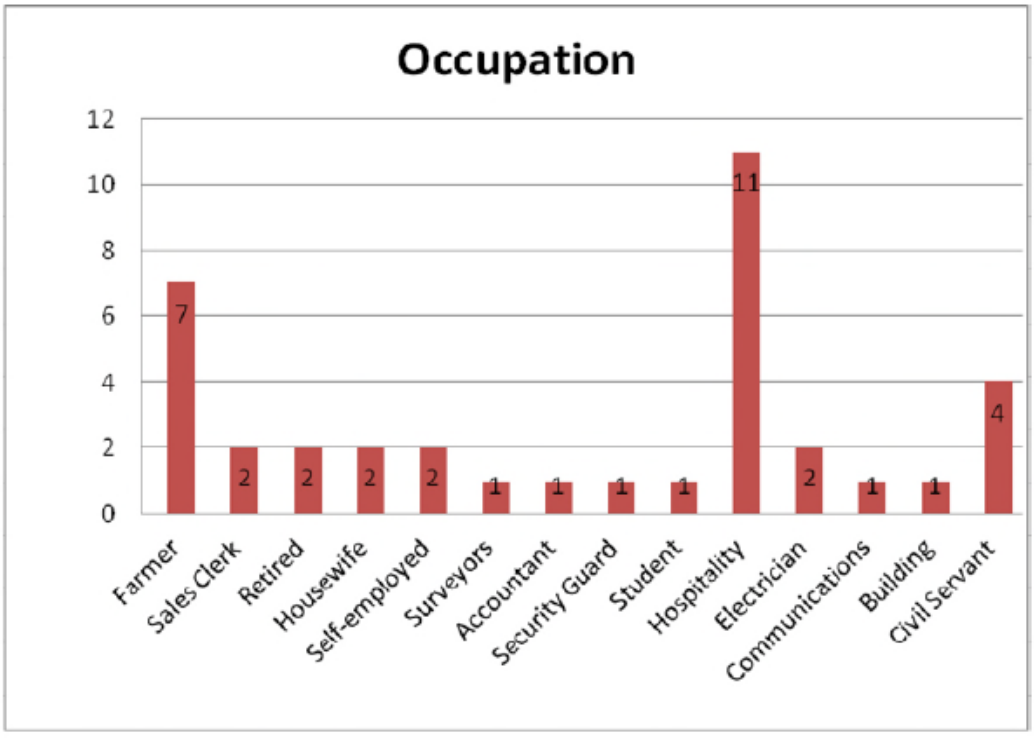

Figure 4.13 : Valley Residents Occupations Caraïbes Environnement Développement & Coll (2013)

There are more men than women in the formal labour force, 70.6% male to 59.5% female. As of 2010, the main sectors of the economy represented as a percentage of the GDP are as follows:

- Government services - 19.2%;
- Tourism - 18%;
- Agriculture - 17.4%;
- Commercial services - 38.9%; and
- Manufacturing - 3.79%.

There is a gender division of labour in Dominica, with women overrepresented in the services sector (both government and commercial). Women in the formal economy are primarily in government services 55.7%, commercial services sector 55.3% followed by the agricultural sector 20.1%. Men represent 79.9% of the formal agricultural sector, and manufacturing.

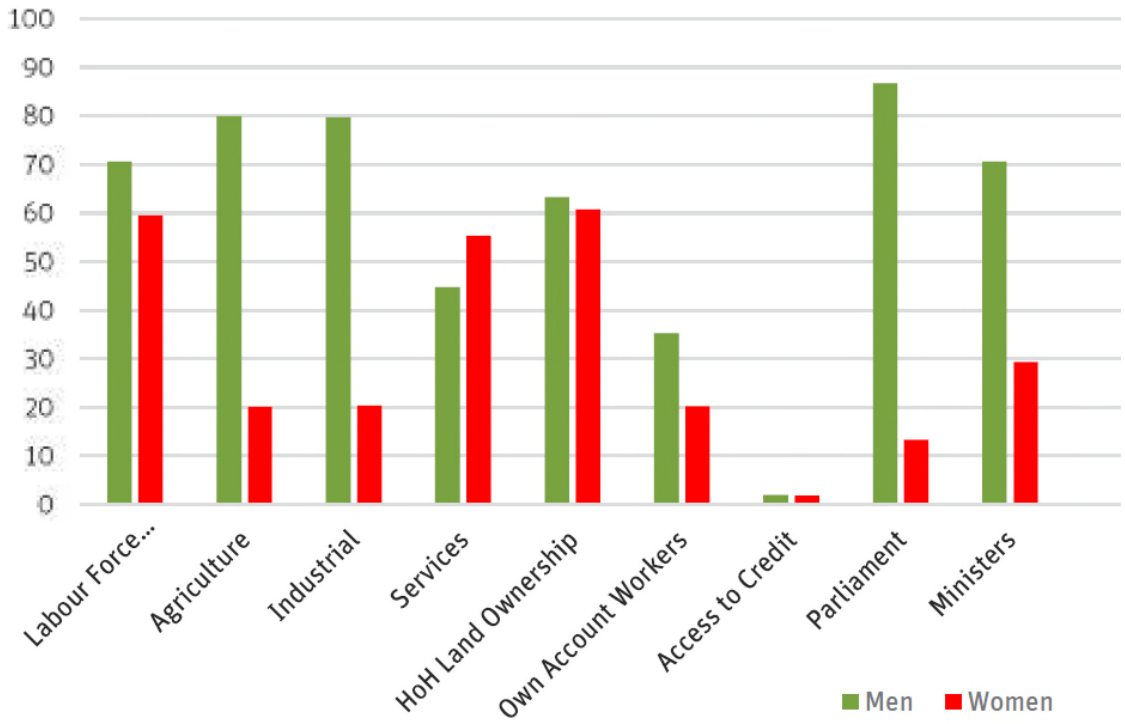

Figure 4.14 : Key Baseline Data for the Sector, CARICOM Gender Equality Indicators: Dominica, WB PNDA

Pre Hurricane-Maria, the villagers were trying to develop regional tourism involving exploration of the wildlife and geothermal resources. Several guest houses and self-catering holiday homes had opened in recent years. Tourist attractions were small in size and employed only a small number of persons. According to the Post-Maria disaster assessment conducted by the WB, 39 percent of hotel/guest rooms are considered severely damaged and will not be back in service at least for a year post the Hurricane. Hotel staff and support personnel have been directly impacted as they deal with the strain of unemployment and the concurrent need to rehabilitate their own properties.

In 2016 according to the CIA World Factbook, the average unemployment rate in Dominica was about 23%. Now post Hurricane-Maria the Post Disaster Report stated that a "significant" proportion of the labour force is unemployed. The report does not quantify what is considered "significant". However, it could be assumed that the unemployment rate post Hurricane Maria, is greater than 23% and the livelihoods of its population may have altered as a result.

4.11.1 Tourism

Jobs and the Tourism Economy

According to the Caribbean Development Bank revenues from tourism in Dominica reached US$49 million in 2006 (The Caribbean Development Bank, 2006). It is difficult to precisely estimate the tourism sector's share of the country's GDP, but it may be between 13 to 19% according to calculations (based on an interview with Discover Dominica Authority in December 2013). An estimated 600 – 1,800 jobs were directly related to tourism, i.e. 7% of the 24,000 jobs in Dominica. According to the Tourism Board, in 2008 approximately 590,000 people visited Dominica and the Roseau Valley on one-day organised tours. Total damage and losses to the tourism industry post-Maria are estimated at EC$ 245M (US$ 116.66 million). Damage to destinations, particularly parks and natural areas will significantly impact the recovery of the tourism sector.[1]

Key Tourist Locations

The Roseau Valley was a popular tourism site due to its proximity to the MTPNP: a UNESCO Natural World Heritage Site covering 17,000 hectares of National Park and its volcanic cirque. According to the Ministry of Tourism, tourism was the main source of income for around 60% of the population. In addition, many cruise ships that stopped for the day in the Port of Roseau allowed visitors to visit the Aerial Tram in the Roseau Valley.

The Roseau Valley also includes the Boiling Lake, Waitukubuli National Trail, Middleham Falls, Freshwater Lake and Boeri Lake, the "Dragon's Mouth" (an accessible cave with hot water) and Twin Falls and Middleham Falls in Trafalgar, Titou Gorge, the freshwater lakes, and the various hot springs in Wotten Waven and Papillote, the tropical gardens in the rainforest, and outdoor adventure activities among other attractions.

[1] WBG Post-Disaster Needs Assessment, Hurricane Maria, September 18, 2017 completed November 7, 2017.

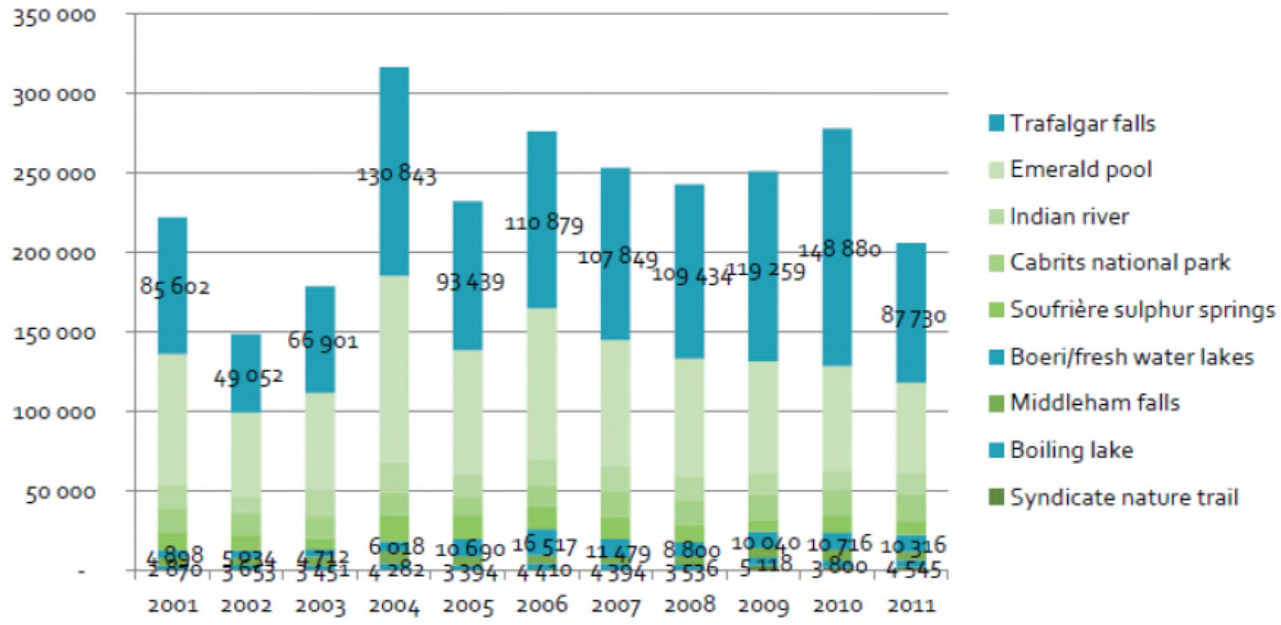

Figure 4.15 : Visitor numbers at the main nature sites for tourism in Dominica between 2001 and 2011 - Roseau Valley sites in blue (Central Statistical Office, 2012)

A summary of the key tourist locations in the Roseau Valley is provided below:

- Trafalgar Falls – A 20 minute drive from Roseau, these popular twin waterfalls are a 15 minute walk where tourists may swim in the warm water springs.
- Sulphur Springs – A 10 minute drive from Trafalgar Falls, sulphur pools and springs can be visited at Tia's Bamboo Cottages, Ti Kwen Cho and Shangri-La Resort, or the Screws Sulphur spa.
- Titou Gorge – A swim from the base of the waterfalls through a 'gorge' which was formed by high cliff walls canopied by interlaced trees.
- Fresh Water Lake – Only 2.5 miles from the village of Laudat high in the MTPNP, this lake is the source of the Roseau River; the freshwater lake is one of two of Dominica's lakes, situated in the area of Laudat. The freshwater lake can be accessed by foot or by guide.
- Waitukubuli National Trail - The Waitukubuli National Trail was officially declared as an eco-tourism site on May 10, 2013, in accordance with the Commonwealth of Dominica Statutory Rules and Orders No. 7 of 2013 National Parks and Protected Areas Regulations (Waitukubuli National Trail Website, 2017). See ESIA Volume 2: EIA for further details.

Tourist Accommodation

According to the Ministry of Tourism, the Valley includes 11 holiday residences (guest houses, cottages). These guest houses provide 94 bedrooms, plus an eventual 22 extra bedrooms, (i.e. 9-12% of bedroom accommodations on the island). Most of the tourism businesses in the Roseau Valley are small (less than 20 employees) and most had fewer than 10 full-time workers. Many of the accommodation businesses interviewed in the area (in 2016) reported having been in business for 20 years or more with hundreds to thousands of visitors per year. Roadside craft vendors reported making 300-500 per month during the high tourist season. Hurricane Maria has caused major impacts to the hotel industry in the Roseau Valley and rendered many of the spas and tourist businesses non-functional or inaccessible. The Post Disaster Report states that 395 of the hotel room stock in Dominica are considered severely damaged. It is considered likely that Hurricane-Maria has reduced or eliminated business in the guest houses in the Roseau Valley, if they are still operating.

4.11.2 Agriculture

Agriculture general accounts for about 20% of GDP in Dominica and employs about 40% of the labour force. As of late 2017 pre-Hurricane Maria, there were about 2,000 hectares (4,900 acres) of land being used as pasture land for animal husbandry, comprising 2.7% of the total land area. In addition to tourism, residents of the Roseau Valley were engaged in crop cultivation and agroforestry. Many properties in the study area included the growth of citrus, other fruits, vegetables, and some root crops for consumption and for sale.

Agriculture is the second highest income-earner for the Roseau Valley's residents after tourism. However, in 2017 farmers were increasingly turning towards tourism which was considered more profitable.

Some villages in the valley were involved in commercial farming in 2017:

- Morne Prosper: mainly vegetables (the land is relatively flat).
- Wotten Waven: more diverse production of flowers, subsistence farming, tubers.
- Trafalgar: smaller-scale production more geared to tourism as well as tubers. There were also 2 small poultry farms.
- Laudat: tuber production, vegetables and subsistence farming.

In 2016 it was reported that there was a reduction in agriculture in most villages, especially Laudat and Trafalgar due to growth in tourism. In 2016, in the Roseau Valley, those working in agriculture are mainly women (in vegetable farming in Morne Prosper and Wotten Waven). Most farms were small production units comprising short-term and small-scale operations (¼ - 1 acre, or 1,000 – 4,000 m^2). Few farmers had larger lots of land, i.e. in excess of 5 acres, or just over 20,000 m^2.

Hurricane Maria caused substantial damage to agriculture in Dominica, including loss and damages to animals, crops, buildings, infrastructure and equipment. Damage to forest resources was also reported, with further impacts to agriculture. The greatest losses were sustained in the agriculture sector (32 percent), followed by the tourism (19 percent) and transport sector (14 percent).[2] It is probable that income from agriculture in the Roseau Valley has been significantly impacted.

4.12 Educational Profile

National school enrolment rates were quite high in Dominica at 97.5% for 5-9 year olds and 98.3% for 10-14 year olds (The Caribbean Development Bank, 2010). According to the Ministry of Education, in 2014, 75 pupils from the Roseau Valley were attending primary school. Approximately 224 students from the Roseau Valley were in Secondary School in 2014. Every village in the Roseau Valley had its own primary school, but pupils must travel to Roseau once they reach secondary school age. This can represent a significant cost for parents, especially for transport. Impacts to social infrastructure such as schools post Hurricane-Maria includes damage to school buildings and infrastructure. Educational facilities on the island, including day-care centres, suffered varying degrees of damage as a result of the storm. Of a total of 163 facilities, 67 (41 percent) suffered major damage and will require reconstruction.

School enrolment pre-Hurricane Maria was slightly higher for males than females, according to the Education Digest from 2015/16 as shown in Figure 4.16 below.

[2] WBG Post-Disaster Needs Assessment, Hurricane Maria, September 18, 2017 completed November 7, 2017.

Cycle	No.	Duration	Age	boys	Girls	total
Day care centers	17	3 yrs.	0-3	122	120	242
ECD centres	73	2 yrs.	3-4+	728	714	1442
Primary	58	7 yrs.	5-11	3,685	3,375	7,060
Secondary	15	5 yrs.	12-16	2,568	2,505	5,073
Tertiary	1	2 yrs.	17+			1,747
TOTAL						15,564

Figure 4.16 : Existing Educational Facilities and Enrolment in Dominica 2015/16

4.13 Health Profile

According to 2017 data from the Ministry of Health, 5.5-6% of births in the country were born to residents of the Roseau Valley in 2015-2016. In 2016, 162 people were seen at the Roseau Valley health clinic for issues ranging from hypertension, diabetes, asthma and colds to heart disease and anaemia. Approximately 75% of these patients were women. The death rate in Dominica is relatively low, 8.1-9.5 per 1,000 live births between 2010 to 2015. Life expectancy is 77 years (81 for women and 74 for men). The infant mortality rate was 20.8 per 1,000 live births in 2015. There were relatively few deaths in the Roseau Valley in 2015, 19 in total. Chronic illnesses recorded in the valley in 2015 included cancer, pneumonia, pregnancy related illness, hypertension, heart disease, motor neuron disease, birth defect, and diseases of the urinary system. Incidences of each were between 1-2 people. Malaria is not typically present in Dominica, but Chikungunya and Dengue fever are health concerns. At least 30 cases of Zika virus were confirmed in Dominica in 2016. According to the CIA Factbook, in 2014, 5.5% of GDP was spent on health (Central Intelligence Agency World Factbook Website (2017).

There are three health centres in the valley one in each of the potentially affected communities (Trafalgar, Wotten Waven and Laudat). The Valley is also close to the capital of Roseau and its health facilities including the Princess Margaret Hospital, which is the country's top health care establishment. The hospital has 224 beds (including 56 in a psychiatric unit) and was recently expanded (Caraïbes Environnement Développement & Coll, May, 2015a/b).

Damage and losses to healthcare facilities post-Maria were estimated at EC$ 48.3M (US$ 17.85M). The Princess Margaret Hospital, Roseau, the only referral hospital in the health care system, sustained severe damage with 15 percent of its buildings totally destroyed leaving only 53 percent functional. Central medical stores lost the majority of medical supplies due to water damage but most medications were spared. Bed capacity was decreased by 95 beds.

4.14 Community Facilities and Utilities

4.14.1 Water

The drinking water system in Dominica is fairly comprehensive and generally covers the main inhabited areas. Potable water (for household, commercial and industrial use) and non-potable water (for agriculture, laundries, fishing industries, leisure activities, etc.) are provided by Dominica Water and Sewerage Company Limited (DOWASCO). To meet the demand for drinking water, DOWASCO extracts resources from 47 rivers, representing 10 million gallons per day (45,460 m^3/day). The Roseau River is one of the 10 largest rivers. Its annual average flow rate is 10 million gallons (45,460 m^3). The capacity of available drinking water is 4.3 million gallons per day (19,547 m^3) for Roseau and its environs. The rate of access to drinking water in Dominica was 97% per the CIA World Factbook (2006) (Central Intelligence Agency World Factbook Website (2017).

The 41 water supply areas on the Island were damaged by strong winds, flooding, landslides, falling trees and power outage, 16 were heavily damaged and 21 moderately damaged by Hurricane Maria. Production and distribution pipelines were damaged or washed away, intake systems were blocked with sand and debris, and storage tanks, pumps, physical structures and access roads were damaged. Estimated damage to water supply infrastructure post-Maria is EC$53.6 million (US$19.85M).

4.14.2 Waste

The Roseau Valley has no formal wastewater disposal system. Some, but not all homes have septic tanks. Nationally, a quarter of households used pit toilets in 2009. The Dominica Solid Waste Management Corporation (DSWMC), established on the 1 July 1997, deals with solid waste management facilities for storage, collection, treatment and disposal of solid waste

4.14.3 Electricity

All homes in the Roseau Valley have electricity through the Rural Electrification Programme, which has helped improve access for the whole country. Only a few isolated houses are not connected to the network. Electricity consumption in Dominica is generally low (100 kWh per customer/month) with a slight rise (1% per year). A pre-payment system has been introduced to ensure bills are paid and to enable the population to better manage their expenditure.

Post-Hurricane Maria, electricity service failed due to widespread damages to the transmission and distribution network. At least 75 percent of the network is down as of late 2017, although part may be recoverable, 80 to 90 percent of the transformers inspected are badly damaged and cannot be repaired. Damage to generation sites vary from moderate to severe. The Trafalgar hydro- generation plant experienced only minor damages to the building structure and Laudat is intact.

4.15 Quality of Life

According to the MIT Press article, by Daniel J. Slottje, entitled 'Measuring the Quality of Life Across Countries,' Dominica ranks 30th internationally among the 126 countries evaluated. This is relatively high, above countries like Italy, Spain and France. According to the 2015 social surveys, "The residents appreciate their valley, its calm, the fact that most people know each other and the luxuriant natural environment close to the town." In addition, residents stated that "The standard of living in Roseau Valley is relatively higher than the rest of the country." Post-Hurricane findings suggest as much as a 20-36 percent decline in the quality of life in some in villages throughout the island. Unless every effort is made to reduce the geographic inequalities during the recovery period, the rural to urban drift may hasten, and the strong tendency towards out migration may increase.

4.16 Vulnerability

In 2016 the social survey respondents, focus groups and wider community expressed that there were no specific vulnerable groups in the Roseau Valley. However, during the surveys disabled members of the community were observed including an amputee, blind, and deaf members of the community who were without support services. Disabled members of the community would be considered vulnerable. Elderly members of the community that could be isolated and widows would also be considered vulnerable. In addition, residents of the Roseau Valley that have been unemployed for a significant length of time (2 years or more) could also be considered vulnerable.

Post-Hurricane Maria, new vulnerable groups are emerging. Surveys in the Project affected communities suggest that 90% of the respondents have lost the roofs of their houses, and 95% of the respondents have lost their livelihoods.[3] Among the non- salaried economically active population 3.1 million work days were lost post-

[3] WBG Post-Disaster Needs Assessment, Hurricane Maria, September 18, 2017 completed November 7, 2017.

Maria. The respective loss in work days and income resulting from the Hurricane, is likely to result in a 25 percent decline in consumption, which could translate into an increased poverty rate of 36.2% (from 28.9% as reported in 2009). This may, in turn, have the undesirable effect of increasing income inequality, which researchers argue could lead to an increase in violence and crime[3].Those community members previously considered vulnerable e.g. elderly or disabled, maybe have been adversely affected by the Hurricane and the damage it has caused, increasing their vulnerability. All of the parties directly affected by the Project were affected by the Hurricane.

5. Stakeholder Engagement

5.1 Stakeholder Engagement Plan

Building on stakeholder engagement that has already been completed during the drilling phase, a process of identifying relevant stakeholders that may be directly or indirectly affected by the project was completed. A Stakeholder Engagement Plan (SEP) was prepared for the Project to guide engagement activities for the Project. The objectives of this SEP are to:

- Identify the local legal framework of consultation activities and disclosure requirements, particularly in respect of those public consultation activities that are directly required under the local permitting process;
- Identify potential stakeholders in the area of influence, as well as relevant interested parties such as government agencies and other key stakeholders. Vulnerable groups (elderly, disabled, unemployed) will are also identified as stakeholders
- Record all consultation activities, including those prior to the commencement of the ESIA process;
- Describe how concerns or grievances will be handled via a Grievance Mechanism;
- Provide an action plan for further consultation including at least two meetings bi-annually in each affected community during preparation, construction and operational phases of the Project, including details on appropriate formats for effective and culturally meaningful interaction with the community and relevant stakeholders; and
- Provide a disclosure plan, including the identification of any locations where relevant project documentation will be available locally and elsewhere as well as languages to be used.

The SEP will be revised and updated periodically including upon completion of the ESIA to assist with ongoing engagement throughout the Project. A copy of the SEP which includes the Grievance Mechanism is provided in Volume 5 – Technical Appendix L.

5.2 Public Engagement to Date

5.2.1 Public Meetings

During the geothermal drilling phase, eleven general public meetings were held in the potentially affected communities in November and December 2013 and January 2014. Five were held in Laudat, three in Trafalgar and three in Wotten-Waven. A visit to the current geothermal power plant in Guadeloupe was also conducted in 2012 with members of the community to experience first -hand the workings of an operational plant. Additionally, school visits were conducted in February and March 2012 from the Wotten Waven Primary School, Trafalgar Primary School, Morne Prosper Primary School, Laudat Primary School, and Laudat Primary School where students and staff toured the drilling sites. In addition to the recent public engagement, the Grievance Mechanism was socialised within the community during the 2017 social baseline survey process.

Figure 5.1 : School Visit to Drilling Site

During the current Project development phase, a town hall meeting was held in Trafalgar in December 2016 with approximately 40 in attendance to discuss the current project and ESIA. Another town hall meeting was held in Laudat in July 2017 with 43 in attendance. A third town hall meeting was held in Wotten Waven in August 2017. A final townhall meeting will be held to present the findings of the ESIA in May or June 2018. In order to facilitate further understanding of community needs and conditions, focus group meetings were held in 2016, 2017 and 2018 in Wotten Waven, Trafalgar and Laudat, described in further detail below. Because the total population of the Project AOI is relatively small (approximately 1,600), and given that the general public and many of the focus groups and landowners that would be affected by the Project are the same parties, the four formal public meetings and 15 informal forums held on the Project were considered representative of the community.

5.2.2 Focus Groups

A total of 15 focus group meetings were held as part of the ESIA baseline data collection. A meeting with six representative community leaders from all of the potentially affected communities was held in Trafalgar in November 2016 to discuss the Project and the most effective means of stakeholder engagement. Focus groups meetings were also held in June, July and August of 2017 including meetings with representatives of local hotels and resorts, handicraft vendors, hot springs businesses, and unemployed parties in the area. Groups consisted of 5-15 people and targeted questions were asked and recorded.

Five focus group meetings were held in the communities in March 2018 following Hurricane Maria. These included meetings with the community women in Laudat, Wotton Waven and Trafalgar, and vendor meetings in Wotton Waven and Trafalgar, to identify the impacts on the community of Hurricane Maria which hit Dominica in September 2017 and to understand how conditions in the Project area have changed since the ESIA baseline data was collected pre-Hurricane Maria. Table 5.1 sets out the range of comments and concerns raised during the ESIA Consultation Activities and where subsequent responses can be found in the ESIA is included below.

Table 5.1 : Summary of Consultation Comments and where Further Information can be Found in the ESIA

Consultation	Comment Category	ESIA Reference	Response
Laudat Community at Laudat Primary School (29/06/2017) Papillote Wilderness Retreat (30/06/2017) Wotton Waven Spa Operators	Noise level of the project and effect on the community	ESIA Volume 2: EIA, Section 12 – Noise (Section 12.5 – Assessment of Impacts).	Operational noise will be within acceptable community noise standards. Noise from construction will be reduced to the extent feasible using best practice mitigation measures.
Laudat Community at Laudat Primary School (29/06/2017) Papillote Wilderness Retreat (30/06/2017) Wotton Waven Spa Operators	Community benefits	ESIA Volume 3: SIA, Employment and community benefits, Section 6.1.1 – Assessment of Impacts and Section 8.1.1 Employment and Tourism.	The GoCD is committed to providing a community benefits package for this Project. There are several ideas for community benefit/investment options detailed in the ESIA.
Papillote Wilderness Retreat (30/06/2017)	Will there be a social/community development fund	ESIA Volume 3: SIA Employment and community benefits, Section 6.1.1 – Assessment of Impacts and Section 8.1.1 Employment and Tourism.	The GoCD is committed to providing a community benefits package for this Project. There are several ideas for community benefit/investment options detailed in the ESIA.
Laudat Community at Laudat Primary School (29/06/2017)	Will the re-injection pipeline pass through villages?	ESIA Volume 3: SIA, Preferred route of re-injection pipeline, Figure 4.3 - Location of Power Plant and Reinjection Pipeline.	The re-injection route pipeline has been selected with the intent of avoiding settlements to the extent feasible.
Papillote Wilderness Retreat (30/06/2017)	What will be the visual impact of the project	ESIA Volume 2: EIA, Section 9 – Landscape and Visual (Section 9.3 – Assessment of Impacts).	The Project is expected to have minor visual impacts with the exception of those living immediate adjacent to the power plant.
Papillote Wilderness Retreat (30/06/2017)	What will the impact on tourism be? Concerns that it will have a negative impact	ESIA Volume 3: SIA, Tourism impacts: Section 6.2.5 Impacts to Tourism. ESIA Volume 3: SIA, Tourism enhancement and mitigation, Section 8.1.1 Employment and Tourism.	Impacts are tourism including thermal spas, etc are considered to be minor. The thermal resource is not likely to be reduced as a result of the Project and the Project could become and educational tourist destination.
Papillote Wilderness Retreat (30/06/2017) Wotton Waven Spa Operators	Traffic impacts on the community and local businesses	ESIA Volume 2: EIA, Traffic impacts, Section 16 – Traffic and Access (Section 16.3 Assessment of Impacts).	Traffic congestion could result during construction and will be mitigated to the extent feasible. Long-term traffic increases are considered minor.
Papillote Wilderness Retreat (30/06/2017) Wotton Waven Spa Operators	Air quality impacts	ESIA Volume 2: EIA, Air Quality impacts, Section 4 – Air Quality (Section 4.3 Assessment of Impacts).	Air quality emissions will be within acceptable community standards. Dust from construction will be reduced to the extent feasible using best practice mitigation measures.
Papillote – Community Leaders of the	Resettlement and land	ESIA Volume 3: SIA,	Impacted land owners will be properly

Consultation	Comment Category	ESIA Reference	Response
Roseau Valley Papillote Wilderness Retreat (30/06/2017) Wotton Waven Spa Operators	acquisition impacts and plans for the community and businesses	Resettlement mitigation plans, Section 8.1.2 Physical and Economic Displacement. ESIA Volume 3: SIA, Land acquisition impacts, Section 6.2 Land Acquisition, Physical Displacement and Resettlement Impacts.	consulted and compensated in accordance with International Standards.
Wotton Waven Spa Operators	What happen if the reinjection pipe has a leak and dangerous fluids are flowing on the surface?	ESIA Volume 2: EIA, Section 15, Hazardous Substances and Waste and ESIA Volume 3: SIA, Emergency Response Plan.	An Emergency Response and Disaster Management Plan will be developed and implemented for the Project in line with best practice.
Laudat Community at Laudat Primary School (29/06/2017)	When and how will payment be made for property and land acquisitions?	See the ARAP.	Impacted land owners will be properly consulted and compensated by the GoCD in accordance with International Standards prior to the commencement of any construction activity.
Laudat Community at Laudat Primary School (29/06/2017) Papillote Wilderness Retreat (30/06/2017)	Potential for community shares in the Project	Outside of the scope of ESIA.	This is outside of the scope of ESIA.
Papillote Wilderness Retreat (30/06/2017)	Why was solar power not considered?	ESIA Volume 2: Introduction, Section 4, Project Alternatives.	This Project evolved on the basis of the geothermal resource.
Papillote Wilderness Retreat (30/06/2017)	Why was this type of consultation not done before decision was made to drill?	See SEP for a full list of consultation activities in Appendix C of the ESIA.	Consultation has been conducted throughout the development of the Project.
Papillote Wilderness Retreat (30/06/2017)	Total cost of the Project	Outside of the scope of ESIA.	This is outside of the scope of ESIA.
Wotton Waven Spa Operators	Project start date and duration	ESIA Volume 2: Introduction, Section 3, Project Description.	Construction date estimated to be first quarter 2019. Estimated 18 -24 months for construction of Project.

5.2.3 Socioeconomic Data

Baseline information was also collected by Caraïbes Environnement Développement & Coll in 2015 including data collected via some desktop study and approximately 30 interviews with local stakeholders. In addition, targeted surveys were conducted in July and August 2017 with specialised groups such as land owners in the site vicinity and representatives of tourism industry that could be affected. A total of 30 additional surveys were conducted and findings are incorporated in the SIA (September 2017). This data included socioeconomic data from the directly affected communities, data from tourism providers, small businesses and potentially vulnerable members of the community. However, there were some limitations to this data, including reluctance on the part of participants to answer questions about income. In addition, some of the surveys were supplemented by observation (e.g. community described that no vulnerable groups were present and some were observed).

Further socio-economic surveys have been completed post Hurricane-Maria in March 2018. From the data collected, it is apparent that there may be more social concerns as the island now has a more fragile economy. However, as with the 2017 surveys there was reluctance from participants to answer questions about income.

5.3 Community Perceptions of Project

Public perceptions of the Project were varied throughout the stakeholder engagement process. Everyone that was spoken to was familiar with the Project and many had been involved in Project related meetings for many years. The 2015 data showed the community had a number of concerns about the Project, but in 2017 most community members expressed support for the Project (approximately 80%). Concerns expressed in 2017 included:

- Health concerns about the steam and air quality emissions associated with the plant;
- Concerns about odours and impacts on the economy from the Project, particularly the tourism industry;
- Noise concerns; and
- Concerns about proper compensation for land to be acquired.

Post-hurricane Maria, concerns now include:

- Natural disasters;
- Improvement of infrastructure;
- Livelihood and tourism impacts;
- Emergency response planning; and
- Cultural impacts from influx of workers during construction.

At public meetings, many questions also arose about public shares in the Project Company (DGDC) and the likelihood of adverse effects on the geothermal resource impacting on tourist businesses. Local residents also expressed concerns about plant emergencies and interface with storms and natural disasters. The ESIA process was explained and the methodology to be undertaken for analysis of relevant topics and plans and expectations for the company were also addressed. A Project Grievance Mechanism has also been disclosed to the local community and several complaints have been recorded and addressed to date (the Grievance Mechanism can be found in Stakeholder Engagement Plan ESIA Volume 5: Technical Appendix L). Details of consultation events with the communities and feedback from these meetings is presented in Appendix C, of the Stakeholder Engagement Plan.

5.3.1 ESIA Disclosure

The ESIA Non-Technical Summary was disclosed to the communities of the Roseau Valley via three public meetings: one in Laudat, one in Trafalgar, and one in Wotten Waven in the first week of July. Meetings were attended by Jacobs, DGDC, and approximately 20 members of each community. The community had another opportunity to express concerns and ask questions about the Project and ESIA findings. Concerns generally included community health and safety issues, natural hazards, employment and construction impacts. A summary of the issues raised by each community is provided below.

5.3.1.1 Laudat

In Laudat, a community meeting was held on Tuesday 4th July 2018. Concerns expressed by the community included technical questions about the pipeline and public health considerations associated with operations of the plant. Community members also voiced concerns about the risks associated with volcanic activity near the project, equipment failure, and other natural disasters. Community members also expressed the desire to see policy changes associated with the Project and the need for some community benefit projects that would be realised in the community. They also asked about land acquisition and noted that Laudat has been the location

for several other projects where few benefits were realised in the local community. The DGDC Team explained the costs and the benefits of the project and the ESIA findings in terms of H2S. DGDC also explained the technology being utilised in the plant and the low risks associated with this type of equipment. The DGDC Team further explained the risks and the planning and design measures that were selected for this project given the topography, risk of landslides and recent flooding from Hurricane Maria and the EPC Contractor requirements that will be put in place to reduce nuisance and community health and safety impacts such as the emergency response and other planning procedures. The current status of land acquisition was also explained and the need to complete compensation before construction can begin, as per OP 4.12. Ongoing monitoring and preventative measures such as the traffic management plan and erosion control measures were also explained. Comments on policy and community benefits were noted, but it was explained that this is ultimately under the control of government and policymakers, rather than the project.

5.3.1.2 Trafalgar

In Trafalgar, a community meeting was held on Wednesday 5th July 2018. Fewer comments were made at this meeting than in Laudat or Wotten Waven, likely because the community is further from the power plant site. The community asked a few technical questions about the distance of the pipeline and natural hazards that could affect the project. They also asked about the proximity to the nearby communities from the power plant and emergency response. The DGDC Team explained the risks and the planning and design measures that were selected given the topography, risk of landslides and recent flooding from Hurricane Maria. DGDC also explained the emergency response and planning procedures that will be put in place for the Project. Examples of other projects where a geothermal plant was located in close proximity to the community were given.

5.3.1.3 Wotten Waven

In Wotten Waven, a community meeting was held on Thursday 6th July 2018. A lot of concern was expressed at the meeting particularly about public health issues, employment, and direct benefits to the community. Specifically, people asked about job requirements, accidents at the plant and/or the pipeline, detrimental effects on thermal spas, the expected lifespan of a well, consumer benefits on electricity bills, health impacts of construction and noise, and property acquisition. A community member also suggested the need for a weekly briefing in the community during the construction phase. The DGDC Team explained the design of the plant and reinjection route given the topography, risk of landslides and recent flooding from Hurricane Maria and to reduce noise and visual affects at properties near the power plant. DGDC also explained the technology being utilised in the plant and the low risks associated with this type of equipment. The lack of changes anticipated for the thermal surface features were also explained given the depth of the wells and associated activity and the plan to conduct ongoing monitoring of these features was also shared. The DGDC Team further explained in detail the noise associated with the steam blowing phase and the limited timeframe for this testing. The current status of land acquisition was also explained and the need to complete compensation before construction as per OP 4.12.

Following the disclosure of the NTS, the full ESIA will be made available to the community in August 2018 via the internet, a hard copy will be available at DGDC's offices, and additional public meetings will be held and publicised by the DGDC.

6. Social Impact Assessment

6.1 Employment

6.1.1 Assessment of Impacts

Employment impacts arising from the construction and operations phases of the Project would 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 Jacobs Project Engineer in July 2017 consist of the following:

- During operation it is anticipated that there will be approximately 12 permanent employees.
- At the height of construction, approximately 50-60 employees would be employed on-site, which would 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 two years, commencing in 2018.

It is likely that 30 to 40 workers will be the power plant 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 outside of Dominica, depending on the selection of the final EPC Contractor. This total could be slightly larger at times if more locals are required to support with construction equipment in difficult locations. As described above, a worker's camp is also proposed on site that would house up to 50 workers throughout the construction phase.

The majority of employment during construction is likely to be short-term and significant employment opportunities for local communities would be limited. The unskilled and semi-skilled workforce is anticipated to generally come from the local area, but accommodation in the form of a worker's camp will be developed on the site to house mainly expat and out of town workers for the duration of construction to minimise traffic trips to the site from Roseau. There is the potential for women to be disproportionately affected as many of the construction jobs will be geared towards men.

Direct Employment

The Project will have a **Moderate Beneficial** impact on employment during construction, both in the Project AoI and in the wider Roseau Valley. 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 favour experienced (skilled) personnel for professional roles, the majority of whom would 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.

Indirect Employment

Plant staff and contractors will require various vendors, suppliers and service providers to meet the daily operating needs of the Project, needs of the worker's camp, 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 utilising 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 (NPC, 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 agricultural producers, as well as induce growth in other industries such as retail, hospitality, transportation, etc. The additional jobs created indirectly would be considered a **Minor Beneficial** impact.

Post Hurricane-Maria the Project would benefit by providing support in re-development of essential infrastructure as well as the provision of new jobs for local residents, indirect economic development impacts, collaboration and public involvement opportunities such as trips to other power facilities, and potential opportunities for education and industry diversification. Women, in particular, tend to work as vendors in the tourism industry and would benefit from opportunities that bring more potential clients into the community. Per the focus groups conducted with the local communities in March 2018, some women saw the Project as a potential tourism attraction through which they envisaged increased tourist arrivals and increased business generated from tourism including vending food and beverages. In addition, the Project proposes to implement community development initiatives through a Community Development Fund. During the community engagement program conducted in 2017 for this ESIA, the following initiatives were proposed for development:

- Educational fund;
- Basketball court in Wotten Waven;
- Healthcare fund and database;
- Local park in the Trafalgar area;
- Visitor centre at power plant site;
- Recording studio; and
- A flower cutting and export business.

Post-Maria community initiatives suggested have a slightly different focus:

- Infrastructure improvements including roads and bridges;
- More extensive community wide disaster and emergency planning;
- The establishment of a skills development fund for the community with a particular focus on young people;
- Scholarships for children in the affected communities for study in related fields;
- A community centre.

Although details of total funding, projects, and timeframe for fund allocation have not been finalised, the GoCD has committed to funding some community development initiatives along with development of the power plant. As a result, all impacts associated with employment and subsequent community development would be anticipated to be beneficial to the community.

Conclusions

Employment impacts are anticipated to result in approximately 40 jobs (direct and indirect) during operations and approximately 60-80 during construction. Given that two of the local communities are made up of approximately 300 people, this would be considered a **Moderate Beneficial** impacts in the Project AoI and in the wider Roseau Valley. Opportunities could be enhanced via training and local job readiness programmes. 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 Beneficial**

indirect impacts from employment would still be anticipated from suppliers and other businesses in the community. Enhancement measures for employment are detailed below.

6.2 Land Acquisition, Physical Displacement, and Resettlement Impacts

6.2.1 Land Acquisition

Power Plant

Construction and operation of the plant will require the acquisition of land for the power plant and for the reinjection pipeline route.

- For construction of the power plant, approximately seven properties are planned to be acquired (two within the proposed Project footprint and five that would be substantially impacted by noise, visual, and construction impacts). All of these properties are currently privately owned and include structures, one of which has been identified as a residence, one as a possible residence (currently a goat shelter) and one a rabbit hutch. Some small-scale farm activities of animal husbandry and cultivation of fruit trees and other crops is presently occurring on at least five of the proposed sites.

Reinjection Pipeline Route

Construction of the reinjection pipeline route corridor would consist of an approximately 10 m wide corridor. Future land requirements include:

- The re-injection route would involve acquisition of some portion of six properties. Most of these affected properties would consist of small portions of parcels and would not impact on any structures. One tenant farmer would be affected by the development of the pipeline.

6.2.2 Efforts to Avoid or Minimise Displacement - Alternative Sites and Reinjection Pipeline Route

Several power plant sites and reinjection pipeline route options were considered as part of the Project (refer to ESIA Volume 1: Introduction). Multiple sites were considered for the power plant once the geothermal resource was identified. The site was gradually moved south-east to create distance from the concentrated local population and reduce noise impacts. In terms of the reinjection pipeline route, four options were considered. One proposed route through Laudat was ultimately rejected to avoid displacement/disruption and another route was rejected as it was scheduled to rely on DOMLEC infrastructure, which presented coordination challenges for the Project. The third option was rejected because it was considered technically too difficult due to topography e.g. steep ravines. Ultimately, the power plant site location and preferred reinjection pipeline route were chosen to avoid disruption to the community and in consideration of economic and technical constraints.

6.2.3 Physical Displacement and Resettlement Impacts

For construction of the power plant and re-injection route pipeline, 13 properties would need to be acquired including some structures, in consisting of 2-3 residences. Some farming is presently occurring at six of the proposed sites.

Of the potential 13 properties to be acquired, physical displacement of structures in approximately three affected properties is predicted to occur as a result of the Project, which will be permanent and considered to be of **Minor** significance. Impacts of this nature can result in poverty and / or dislocation of communities and the severance of extended support networks. Post-Hurricane Maria, impacts to any vulnerable parties may be even more severe. If not mitigated appropriately and early, resettlement impacts can cause great controversy and result in significant public objections, time delays and considerable cost overruns for the Project.

As part of due diligence for legacy Project activities to ensure that resettlement and land acquisition impacts from the drilling phase have been addressed in line with WB requirements for involuntary resettlement, a Land

Acquisition Review was conducted in 2017 including an Action Plan developed to address any gaps between WB and national standards for land acquisition and resettlement. The Action Plan is currently being implemented by the GoCD

For proposed land acquisitions and resettlement associated with the Project, an Abbreviated Resettlement Action Plan (ARAP) has been developed in consultation with affected parties. The ARAP will provide resettlement sites where appropriate and / or cash compensation and livelihood restoration measures including consideration of those considered to be severely affected and or vulnerable.

In the long-term, impacts are expected to decrease further as affected people realise some of the benefits of compensation and livelihood restoration initiatives, and as the other mitigation and monitoring measures are implemented along with community development initiatives.

6.2.4 Economic Displacement and Livelihood Impacts

Along with experiencing physical displacement, six of the parties affected by resettlement for the proposed power plant site and the reinjection pipeline route will experience economic displacement effects as many of the affected properties include agricultural crops, livestock, and trees. In particular, surveys show that some potentially affected parties for the power plant site are presently growing citrus, and raising sheep or rabbits. On the proposed power plant site, two farming structures have been identified that would likely be displaced as a result of the project. In addition to these directly affected structures there are six properties that contain crops, fruit trees or livestock.

The Project would also potentially impact ecosystem services in the Project area. The key ecosystem services which have the potential to be significantly affected by the Project are the ecotourism resources including thermal spas, medicinal plants, handicrafts, and water related resources. The Project could potentially have a negative impact on water resources in the area, which would in turn affect ecosystem services. Post-Hurricane Maria, impacts to any vulnerable parties may be even more severe.

Many of the concerns raised in stakeholder engagement activities were about perceived loss of habitat or impact on water resources rather than physical effects anticipated by the Project. According to ESIA Volume 2: EIA, Terrestrial Ecology (Section 13) with regards to residual impacts for terrestrial habitats that may provide ecosystem services there will be limited impacts from the Project in the Roseau Valley. According to the hydrology section of the ESIA, the most likely impact would be the permanent removal of the forest trees where the pipeline will be laid, which reduces canopy storage and interception, and could lead to a small amount of increased surface water runoff**.** The additional livelihood impacts that could result from impacts to agriculture and livestock as well as ecosystem services would be considered **Minor** significance prior to mitigation.

6.2.5 Impacts to Tourism

Project impacts to tourism could result from:

- Roadway access restrictions during construction restricting access for visitors in the Valley;
- Potentially adverse effects to the World Heritage site or geothermal features in the Roseau Valley; and
- Any potentially beneficial impacts to local tourism businesses due to increased activity during construction and operations in the AoI.

As discussed in the traffic section of ESIA Volume 2: EIA, Section 16, minor access restrictions are anticipated during construction, which would last up to two years. However, because of hurricane damage to the roadway and many of the spas and hotels, business and access to these communities has already been significantly reduced and very few tourism businesses in Wotten Waven and Trafalgar are still operating. Although these impacts would 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 would be expected to experience a minor increase in local business due to the presence of construction and operational employees in the Valley.

The proposed Project is located approximately 500 m from the World Heritage site boundary and no air quality or noise impacts are expected to occur in the World Heritage site as a result of the Project (see ESIA Volume 2: EIA, Sections 4 and 12 on Air Quality and Noise). As outlined in Section 14 of the ESIA, no changes to the protection and management of the of the World Heritage site are part of the Project proposals, thus no adverse impacts on the Outstanding Universal Value of the World Heritage site are anticipated. In addition, as outlined in ESIA Volume 2: EIA Section 10 of the ESIA, Project impacts on geothermal resource such as hot springs could potentially result in an increase or a decrease in flow. However, given the small size of the power plant relative to the modelled size of the resource (the proposed Project is currently designed to a 7 MWe capacity which is approximately 10% of the total reservoir capacity) and the siting of injection close to the injection sector impacts to the local geothermal resource are anticipated to be **Minor or Negligible**. Post-Hurricane Maria as severe damage has occurred involving many of the islands eco-tourism and natural resources, impacts would be considered to be even fewer.

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 would result from the Project. As such, it will be particularly important that any proposed mitigation measures specifically consider additional opportunities for women.

As a result of all of the above both adverse and beneficial impacts to tourism combined, a **Minor** impact on tourism businesses in the community would still be anticipated. Mitigation measures for employment and tourism are detailed in Section 7.

6.3 Community Health, Safety and Security Impacts

6.3.1 Assessment of Impacts

Health and safety impacts arising from the construction, operations and decommissioning of the Project are likely to include the following:

- Increased risk of traffic hazards and incidents associated with the construction routes (see Section 6.25 above);
- Exposure to hydrogen sulphide gas, leakage, and well blow outs;
- Major accidents associated with the storage, use of working fluid (typically n-pentane) for Binary Plant;
- Exposure to Project-related hazards associated with construction and operational activities;
- Site security issues including public access to the power plant, the reinjection route pipeline and potential traffic accidents with the pipeline;
- Increase in communicable diseases and social conflicts;
- Community health impacts related to dust emission during construction that will exacerbate existing or cause new conditions (e.g. respiratory, eye, skin diseases); and
- Health and safety risks associated with ponds, confined spaces and risk of fire.

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 and noise related nuisance impacts from construction are anticipated to be **Minor** and **Negligible** respectively and short-term. H_2S concentrations during operations are predicted to be well below World Health Organisation (WHO) thresholds of observed adverse effect levels. Overall health impacts of the Project are

therefore considered to be **Negligible** and the life expectancy of 77 years in Dominica is not anticipated to change as a result of the proposed Project.

The Project is anticipated to include influx of 50-60 workers during construction and 12 permanent employees during operations, which can involve exposure to communicable diseases and potential community conflicts. Construction workers anticipated to predominantly be sourced from outside of Dominica and therefore mitigation measures will be implemented to ensure that health, safety, and security risks from Project workers remain low (refer to Section 8.3.1 below).

Community safety impacts from increased roads and traffic and associated safety risks would be considered to have a potential impact of **Moderate** significance. However, impacts would likely be short-term and localised and risks would 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 would likely be most susceptible to the community health risks.

6.4 Cumulative Impacts Assessment

There are not many major developments of this type in the area and impacts of the Project are anticipated to be fairly unique to the development itself. Although there are other power sources on the island, the Project area is largely isolated and development of a 7 MW power plant is not anticipated to result in significant cumulative social impacts.

However, given the relatively pristine nature of the Roseau Valley, 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.

The mitigation and enhancement measures proposed below would ensure that long-term impacts would be at worst, of **Minor** adverse significance. However, careful monitoring of these measures and their effectiveness will be crucial to ensure that cumulative impacts remain **Minor** adverse or less. See Section 8 for mitigation measures.

7. Cultural Heritage

7.1 Introduction

Assessment of Project's impacts on cultural heritage identifies the following aspects for consideration:

- Above ground sensitive features;
- Potential for survival of archeologically artefacts;
- National or international designated features of cultural significance; and
- Intangible cultural heritage resources.

The method of assessing impacts is as described above in Section 3.

7.2 Baseline

Current baseline information collected by Caraïbes Environnement Développement & Coll in 2015 identified some culturally significant aspects in the Roseau Valley, including those related to agricultural heritage and architectural heritage. The complex and ancient history of human occupation of the island has led to numerous influences on current and past architecture in the Roseau Valley. One example from Wotten Waven includes a water mill dating from the 18th century. However, it is generally considered that the Roseau Valley has few examples of extant historical heritage.

Despite the rich and complex history of the island, with its multitude of anthropogenic influences long before the arrival of Europeans in the 15th century, few physical traces are still present. To date, there are no known significant archaeological sites in the Roseau Valley (Caraïbes Environnement Développement & Coll in 2015).

During consultation meetings with community members and stakeholders, no issues of cultural heritage concern were raised.

7.3 Impact Assessment

Negligible potential impacts are anticipated on physical cultural heritage as all known cultural artefacts are located away from the Project boundaries. It is also very unlikely that any cultural artefact will be found during earthworks activities. However, a Chance Find Procedure will be implemented by the Engineer, Procure and Construct (EPC) Contractor and all its sub-contractors to address the risk of finding cultural heritage artefacts.

7.4 Chance Find Procedure

'Chance finds' are defined as physical cultural resources encountered unexpectedly during project implementation. 'Physical cultural resources' (PCR) are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Their cultural interest may be at the local, municipal, department or international level. The requirements for the chance finds will follow the recommendations of the WB PS8, which defines Chance Finds as, *"Tangible cultural heritage encountered unexpectedly during project construction or operation"*. Neither the DGDC nor the EPC will disturb any chance finds further until a competent specialist appointed by either the Ministry of Youth, Sports, Culture and Constituency Empowerment, or the Dominica Museum has assessed the situation and actions identified the appropriate measures to be taken. The DGDC will liaise closely with the GoCD and the EPC to ensure that the assessment and recommended actions are carried out in a manner that will not be prejudicial to the planned works.

Upon discovery of a physical artefact work will be stopped, the site will be fenced and procedures for reporting will commence. Following internal reporting, the first external notification will be to the GoCD Ministry of Youth, Sports, Culture and Constituency Empowerment, followed by the Dominica Museum in Roseau.

8. Mitigation, Enhancement Measures and Residual Impacts

8.1 Mitigation and Enhancement Measures

8.1.1 General

The EPC Contractor and all Subcontractors will respect and apply industrial good practices as highlighted in WBG EHS Guidelines. This includes among others: no operation during night time near inhabited settlements, implementation of noise and dust control measures, low speed limits for the Project's vehicles in inhabited areas. DGDC will ensure that this is being completed through regular site visits and auditing of reports.

8.1.2 Grievance

DGDC will implement regular consultations with PAPs, their grievances will be lodged, treated and addressed. The GoCD will be responsible for grievances related to land acquisition in accordance with the Stakeholder Engagement Plan (SEP). The Grievance Mechanism defined in the SEP will be disclosed by DGDC to the neighbouring communities and implemented, and grievances registered and addressed on a case by case basis. Note: The Grievance Mechanism was disclosed to Laudat, Trafalgar and Wotten Waven communities in July 2017. It will be disclosed again to these communities at least six months before the start of construction.

8.1.3 Employment and Tourism

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 would 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 Workforce Development Strategy – a commitment to maximise employment and skills opportunities for local people.
- Develop a training and skills programme 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 programme 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;
- Ensure that women working in the tourism industry have access to capital and to the formal sector employment it creates via the development of microfinance/microcredit groups in the affected community;
- Establish a local employment brokerage that will publicise job vacancies and put in place initiatives to ensure employment opportunities for hard to reach groups.
- The tourism providers in the Roseau Valley will be contacted immediately prior to the construction stages. Activities adjacent to local businesses will be restricted to the extent feasible.
- Development of a Community Development Fund to undertake a range of community development initiatives including tourism related activities as described above in Section 6.2.5.
- 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 should ensure that workers are aware of how and where to make complaints using the Project Grievance Mechanism.

8.1.4 Physical and Economic Displacement

For future land acquisitions and resettlement associated with the power plant footprint, noise impacts, and the reinjection pipeline, an Abbreviated Resettlement Action Plan (ARAP) is presently being developed in consultation with affected parties. The ARAP developed in line with WB involuntary resettlement requirements considers resettlement sites where appropriate and / or cash compensation and livelihood restoration measures including consideration of those considered to be severely affected and or vulnerable.

Mitigation measures for physical and economic displacement are likely to include the following:

- Ensuring that the Action Plan from the Land Acquisition Review completed for the drilling phase has been properly implemented.
- Developing an ARAP that considers livelihood restoration, impacts to ecosystem services and the requirements of WB involuntary resettlement.
- Implement the ARAP prior to commencement of Project construction. Continue consultation with the Affected Community and ensure that the Stakeholder Engagement Plan for the Project continues to meet the requirements of WB PS 1.
- The Government of Dominica shall invest in and complete some of community development projects that are identified by that community, which contribute to the welfare of the local community.

8.1.5 Community Health and Safety

The following mitigation measures are recommended 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.
- A Worker Policy and Code of Behaviour shall be developed which includes guidance on visits, prescribed actions for conduct violations and a grievance mechanism for complaints.
- Provide a cultural education programme for workers from outside the area to help reduce community conflict.
- Work camp regulations shall also be developed to minimise local nuisance.
- 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.
- The EPC contractor 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 Behaviour shall be developed which includes guidance on visits, prescribed actions for conduct violations and a grievance mechanism for complaints.
- An HIV/AIDS awareness and prevention program shall be implemented to provide the community with tools and education materials to reduce the spread of HIV/AIDS.
- An important aspect of minimising the spread of communicable diseases within the community is worker health screening, particularly as many workers are local people. A worker health screening programme shall be developed and implemented.
- 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 WB PS 2 international requirements under IFC Performance Standard 2.
- Develop and implement a Workforce Code of Conduct that addresses issues such as anti-social behaviour, drug and alcohol consumption, banning weapons, and including respect for women.

- Onsite health care shall be provided to ensure prompt medical attention.
- An important aspect of minimising the spread of communicable diseases within the community is worker health screening, particularly as many workers are anticipated to be sourced from outside of Dominica. A worker health screening programme shall be developed and implemented during the peak construction period.
- 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 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.

8.2 Monitoring

The following monitoring strategies should be implemented:

- During construction and operation of the development the number of people being employed by the Project should be monitored from: 1) the three key Villages (Laudat, Trafalgar and Wotten Waven) and 2) the wider Roseau Valley, against predicted numbers of employees.
- During construction and operation, surveys should be conducted to determine the number of new businesses and increase or decrease in tourism businesses generated by the development and the level of indirect employment.
- A DGDC Community Liaison Officer will be responsible for updating and monitoring the implementation of the ARAP and Grievance Mechanism defined in the SEP, with the exception of land acquisition issues which shall be managed by the GoCD.
- Throughout the construction ongoing consultation and communication with the local community will be required particularly with PAPs, vulnerable groups and key stakeholder groups. The minutes of meetings and signed lists of attendees will be completed and documented.
- An independent third party review is recommended of the effective implementation of the ARAP, one year after civil construction works commence at the power plant and reinjection line.
- The following will be monitored through on-site visits on a quarterly basis:
  - effectivity of the implementation of good practices as per World Bank Health Safety and Environment (HSE) Guidelines;
  - existence of access control;
  - number of sanitation facilities available for men and for women at each construction site; and
  - effectivity of access restriction measures along the transmission line and its towers.
- The DGDC Human Resources Department will monitor the following on a quarterly basis:
  - effectivity of the implementation of good practices as per World Bank HSE Guidelines
- The records are to be reported to DGDC and any applicable regulatory authorities who then can document and respond to this information as part of their responsibilities.
- During the first four years of operation, on a quarterly basis, DGDC's department responsible for Corporate Social Responsibility (CSR) will record the number of inhabitants of the three villages affected by the power

plant to have received training, and nature of training received, disaggregated by age, sex and village/block.

- During the first four years of operation, the number of consultations with local communities will be recorded through minutes of meetings and signed lists of attendees.
- Grievance resolutions and database will be monitored for the first four years with progress reported on a quarterly basis.

9. Residual Impacts

9.1.1 Employment

With the measures described above, the residual significance is expected to remain of **Moderate Beneficial** significance. In the long-term, employment impacts are anticipated to decrease, but remain of **Minor Beneficial** significance.

9.1.2 Physical and Economic Displacement

With the measures described above, the residual impacts are expected to be remain of **Minor** significance. In the long-term, impacts are expected to decrease and conditions to improve as a result of ARAP compensation, resettlement and livelihood restoration measures proposed mitigation, but would still be considered **Minor** as resettlement impacts would be permanent.

9.1.3 Community Health and Safety

With the mitigation measures described above, the residual impacts are expected to be reduced to **Minor** significance.

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