UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

FINAL GRADUATION PROJECT NAME

Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia

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This Final Graduation Project was approved by the University as partial fulfillment of the requirements to opt for the Master in Project Management (MPM) Degree

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DEDICATION

To my loving, beautiful, exciting, smart, daring and awesome daughter ‘Chatannye’ for giving me reasons to continue to strive for excellence. I hope this will inspire and motivate you now, and in the future, as you continue your educational journey. Your kisses, hugs and encouragement made this process easier.

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To the staff and professors of UCI who influenced my growth during this journey, I say, ‘Thank you’. This program was indeed a great experience; it was well structured, highly informative and a great experience working with an awesome project team. I acknowledge with gratitude my tutor, Mr. Carlos Brenes Vega, for his insight, expertise, guidance and presence during the tutorship phase of this Final Graduation Project.

I express my deepest thanks to my family and friends. I am forever thankful for your unwavering support, love and encouragement which helped me successfully complete this program.

Thank you, Heavenly Father for the gift of health to pursue this Masters Program and see it to completion.

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ABBREVIATIONS AND ACRONYMS

EEF	-	Enterprise Environmental Factors
ESIA	-	Environmental and Social Impact Assessment
FGP	-	Final Graduation Project
GOSL	-	Government of St. Lucia
OPA	-	Organizational Process Assets
PMIS	-	Project Management Information System
WBS	-	Work Breakdown Structure

EXECUTIVE SUMMARY (ABSTRACT)

St Lucia has a long history of geothermal exploration going back to the 1970s and efforts to determine its potential are ongoing. A World Bank preliminary assessment indicated that there is significant unexploited geothermal potential, especially in the Eastern Caribbean (St. Lucia included) that can supply base load power for local markets and beyond. Hence the Government of St Lucia (GOSL) with technical and financial assistance from World Bank, has proposed a geothermal exploration program to test the geothermal resource and evaluate the feasibility of commercial geothermal power production.

Geothermal energy utilization as a renewable source of energy is gaining momentum as the Caribbean seeks to reduce reliance on fossil fuel as a means of mitigating the impact of climate change, responding to market forces and the steady depletion of traditional energy sources. A policy objective of the GOSL is to reduce domestic reliance on fossil fuel generated energy, hence resumption of geothermal exploration in Saint Lucia is seen as timely and strategic as the country looks inward to improve the socio-economic well-being of its citizens, reduce consumption of non-renewable fossil fuels, improve ecological health, and strengthen climate change adaptation.

The Project Management Plan provided a comprehensive baseline which examined the environmental factors (such as water quality, air quality, noise level, geology/soil, natural habitats and bio-diversity); and social factors (such as displacement and disputes over land rights, the rights of indigenous people, impact on livelihood and well-being of farmers and community members, short-term disruptions such as traffic, noise pollution, depletion of water supply, loss of recreational facilities, stakeholder engagement and consultation) of geothermal energy development to ascertain its impact on a community and national level.

The general objective is to develop a Project Management Plan for the development of geothermal energy in St Lucia, that will ultimately provide a mechanism for monitoring and controlling the social and environmental impact throughout the execution of the project. Additionally, the plan analyzes specific objectives which are to develop a scope management plan to define, control and allocate the right amount of work necessary to successfully complete the project; to create a schedule management plan for the management of the project and to ensure that the deliverables are realized within the established time frame; to create a cost management plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget constraints; to develop a communications management plan to ensure that the needs of the project and its stakeholders are met through timely and effective communication; to create a stakeholder management plan to identify and categorize project stakeholders, analyze stakeholders' expectations, develop appropriate strategies for stakeholder engagement; and to develop a risk management plan to identify and evaluate risks throughout the project life cycle

and to implement risk response strategies to mitigate the impact of negative risks and exploit positive risks.

The methodology for the research was completed through the utilization of three (3) research methods namely analytical, descriptive, qualitative and quantitative methods. A combination of approaches was used including interviews, questionnaires (containing questions testing attitudes, closed and open- ended questions), focus group discussions and desk research to provide an in-depth perspective and analysis of the environmental and social impact of geothermal energy development in Saint Lucia.

In conclusion, the PMBOK's 6th edition, provided the processes and techniques needed to develop the project management plan. The plan focused on key and relevant knowledge areas to develop the scope, schedule, cost, communications, stakeholder and risk management plans to realize the project deliverables. The scope management plan examined the environmental and social factors to be considered for geothermal energy development through the utilization of literature reviews and field research. The schedule management depicted the project baseline schedule duration of 52 days and applicable tools and methods for planning, monitoring and control of the required project work. The cost management plan detailed the allocation of costs for completing all project activities within the determined budget. A comprehensive communications management plan depicted the relevant communication techniques for effective two-way feedback with stakeholders. The development of the stakeholder management plan provided the appropriate management strategies to effectively engage stakeholders based on analysis of their needs, interests and potential impact on project success. Additionally, the risks management plan provided the documented plan for identifying, analyzing, and prioritizing risks and development of risk management strategies for both negative and positive risks.

It is recommended that the Renewable Energy Division use the Project Management Plan as a basis to provide the Project Team with the necessary tools and techniques to be able to manage the project execution using best practices; and ensure that the project team be familiarized with the templates provided in each plan in order to use them appropriately. It is imperative that the Energy Division conduct monthly meetings to keep track of the project charter, subsidiary plans and the progress towards the completion of the project objectives. All data received should be analyzed in order to track progress accurately and control any emergent risk(s) that might appear. Additionally, the Renewable Energy Division should develop a quality policy for planning, managing and controlling the project's quality requirements, which include ensuring that air, noise and water inspection monitoring systems meet international standards; and provide communications training to the Project Team to encourage better stakeholder engagements. The creation of a procurement plan to outsource communications trainings and technical services for air, noise and water inspection will be appropriate as experts in these fields are better equipped and more knowledgeable in providing the relevant training and services.

1 INTRODUCTION

1.1. BACKGROUND

Geothermal energy utilization as a renewable source of energy is gaining momentum as the Caribbean seeks to reduce reliance on fossil fuel as a means of mitigating the impact of climate change. *CARICOM has mandated the Caribbean Community Climate Change Centre to mainstream climate change adaptation strategies into the sustainable development agendas to help them switch to renewable and cleaner energy sources and reduce vulnerability to the impact of a changing climate*[1]. Consequently, the Government of Saint Lucia (GOSL) has proposed a geothermal exploration program to test the geothermal resource and evaluate the feasibility of commercial geothermal power production.

Geothermal energy is the immense resource of natural heat that is ever generating inside the earth, which currently produces clean, reliable energy to dozens of nations around the world[2] . Figure 1 reflects the Geothermal Energy Development Cycle to aid with a better appreciation of the process.

[1] A Caribbean strategy to cope with climate change. Retrieved 26 May 2018 from http://www.unesco.org/new/en/media-services/single-view/news/a_caribbean_strategy_to_cope_with_climate_change/

[2] Geothermal Energy: A Renewable Option. Retrieved 17 May 2018 from http://www.videoproject.com/Geothermal-Energy-A-Renewable-Option.html

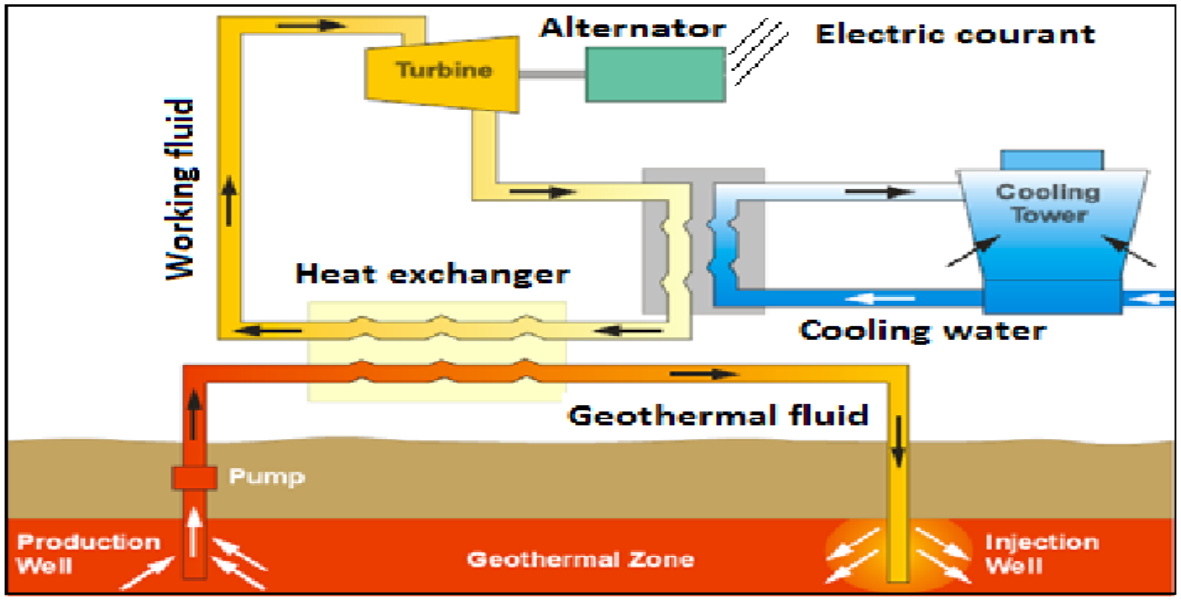

Figure 1 **Geothermal Energy Cycle** **(Source: https://www.researchgate.net/figure/Schematic-of-a-typical-binary-cycle-geothermal-power-plant-7_fig1_283499353)**

St Lucia has a long history of geothermal exploration going back to the 1970's and efforts to determine its potential are ongoing. A World Bank preliminary assessment indicated that there is significant unexploited geothermal potential, especially in the Eastern Caribbean (St. Lucia included) that can supply base load power for local markets and beyond[3]. Guadeloupe (Bouillante Geothermal Power Plant) is presently the only Caribbean Country with a functional plant. The GOSL, with assistance from World Bank, has secured project financing and technical support to advance the Geothermal Resource Development Project within the Soufriere, Choiseul and Laborie regions.

1.2. STATEMENT OF THE PROBLEM

A policy objective of the GOSL is to reduce domestic reliance on fossil fuel generated energy, hence the need for exploring Geothermal Energy as a renewable source of energy.

[3] Promoting Growth in the Caribbean: Geothermal Renewable Energy. Retrieved 17 May 2018 from http://documents.worldbank.org/curated/en/202651468230958748/pdf/786080WP015-0G00Box377349B00PUBLIC0.pdf

In order for geothermal resources to achieve popularity as a renewable energy alternative, there is need to clearly identify the social and environmental impacts of its development[4]. The Project Management Plan is intended to provide valuable information to facilitate a better understanding and appreciation of the impact of geothermal energy development on a social and environmental level.

1.3. PURPOSE

The purpose of the Project Management Plan is to develop a comprehensive baseline to examine the social and environmental impact of geothermal energy on a community and national level by integrating PMBOK's processes and techniques.

Geothermal energy development in St Lucia is expected to reduce carbon footprints, improve the socio-economic well-being of its citizens, reduce consumption of non-renewable fossil fuels, improve ecological health, and strengthen climate change adaptation at the level of community and country. The Project Management Plan will include (1) social factors such as displacement and disputes over land rights, the rights of indigenous people, impact on livelihood and well-being of farmers and community members, short-term disruptions such as traffic, noise pollution, depletion of water supply, loss of recreational facility, stakeholder engagement and consultation, and (2) environmental factors such as water quality, air quality, geology/soil, natural habitats and bio-diversity.

1.4. GENERAL OBJECTIVE

To develop a Project Management Plan for the development of geothermal energy in St Lucia that will ultimately provide a mechanism for monitoring and controlling the social and environmental impact throughout the execution of the project.

[4] Environmental and Social Considerations in Geothermal Development. Retrieved 26 May 2018 from https://orkustofnun.is/gogn/unu-gtp-sc/UNU-GTP-SC-01-15.pdf

1.5. SPECIFIC OBJECTIVES

Based on the above general objective and the project scope, the FGP will focus on pertinent knowledge areas which are key to the realization of the project's objectives. These specific knowledge areas were chosen to provide a comprehensive baseline to examine the social and environmental impact aspect of the development of geothermal energy. The following are the specific objectives:

1.5.1 To develop a Scope Management Plan to define, control and allocate the right amount of work necessary to successfully complete the project.

1.5.2 To create a Schedule Management Plan for the management of the project and to ensure that the deliverables are realized within the established time frame.

1.5.3 To create a Cost Management Plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget constraints.

1.5.4 To develop a Communications Management Plan to ensure that the needs or the project and its stakeholders are met through timely and effective communication.

1.5.5 To create a Stakeholder Management Plan to identify and categorize project stakeholders, analyze stakeholders' expectations and to develop appropriate strategies for stakeholder engagement.

1.5.6 To develop a Risk Management Plan to identify and evaluate risks throughout the project life cycle and to implement risk response strategies to mitigate the impact of negative risks and exploit positive risks.

2 THEORETICAL FRAMEWORK

2.1 COMPANY/ENTERPRISE FRAMEWORK

2.1.1 COMPANY/ENTERPRISE BACKGROUND

The Department of Sustainable Development is in transition. It was formally under the portfolio of the Ministry of Education, Innovation, Gender Relations and Sustainable Development, however, it is currently under the Renewable Energy Division in the Ministry of Infrastructure, Ports, Energy and Labor. The Renewable Energy Division is responsible for the Geothermal Energy Project. The Division's development of a geothermal resource is in keeping with government's policy objective to reduce Saint Lucia's dependence on fossil fuels for energy generation. In 2014, Saint Lucia committed to achieving a national target of meeting 35 percent of its energy requirements from renewable sources by the year 2020[5].

Presently the GOSL proposes to conduct a Geothermal Resource Exploration Program to test the geothermal resource and evaluate the feasibility of commercial geothermal power production in Saint Lucia. Based on a preliminary geothermal estimate carried out by the World Bank[6], St Lucia's geothermal potential is as follows:

- Peak Demands – 60MW
- Installed Capacity – 89MW
- Geo Potential – 75MW

The Geothermal Exploration Program would include slim diameter wells to obtain information on the geology and temperature gradient in the area and will be concentrated in the Soufriere, Choiseul and Laborie regions. Deep geothermal

[5] Geothermal Energy Drilling. Retrieved 30 May 2018 from http://www.govt.lc/news/geothermal-energy-drilling-by-2018

[6] Promoting Growth in the Caribbean: Geothermal Renewable Energy. Retrieved 17 May 2018 from http://documents.worldbank.org/curated/en/202651468230958748/pdf/786080WP015-0G00Box377349B00PUBLIC0.pdf

wells may be drilled, with larger drilling rigs if the initial drilling is successful. The outcome of the drilling program will provide GOSL with information on the viability of geothermal energy investments.

2.1.2 MISSION AND VISION STATEMENTS

The Government of Saint Lucia envisages that developing the country's geothermal resource is a key strategy and a practical way to meet its sustainable energy target. The Division's Mission and Vison statements[7] speak to environmental management, fostering a green economy and improving quality of life, hence the consideration and investment towards geothermal energy as a renewable form of energy.

Mission: To lead the process of achieving sustainable development through the facilitation of an integrated and participatory approach to governance; the promotion of environmental management and innovative technologies; building capacity to adapt and mitigate the impacts of climate change; and demonstrating the value of building a green economy.

Vision: To achieve sustainable development on a platform of integrated and effective environmental management in order that socio-cultural, economic and environmental goals are realized and collectively contribute to the continuous improvement in the quality of life of all Saint Lucians.

2.1.3 ORGANIZATIONAL STRUCTURE

Below (Figure 2) depicts the organizational chart for the Renewable Energy Division of the Ministry of Infrastructure, Ports, Energy and Labor. It is subject to change as the Ministry is currently in transition. Presently there are 5 staff members in this Division including the Chief Energy Officer (Head of the Division); two Energy Officers, one Information and Technology Officer and a Professional Cadet.

[7] Vision and Mission Statements. Retrieved 01 June 01 2018 from http://sustainabledevelopment.govt.lc/about

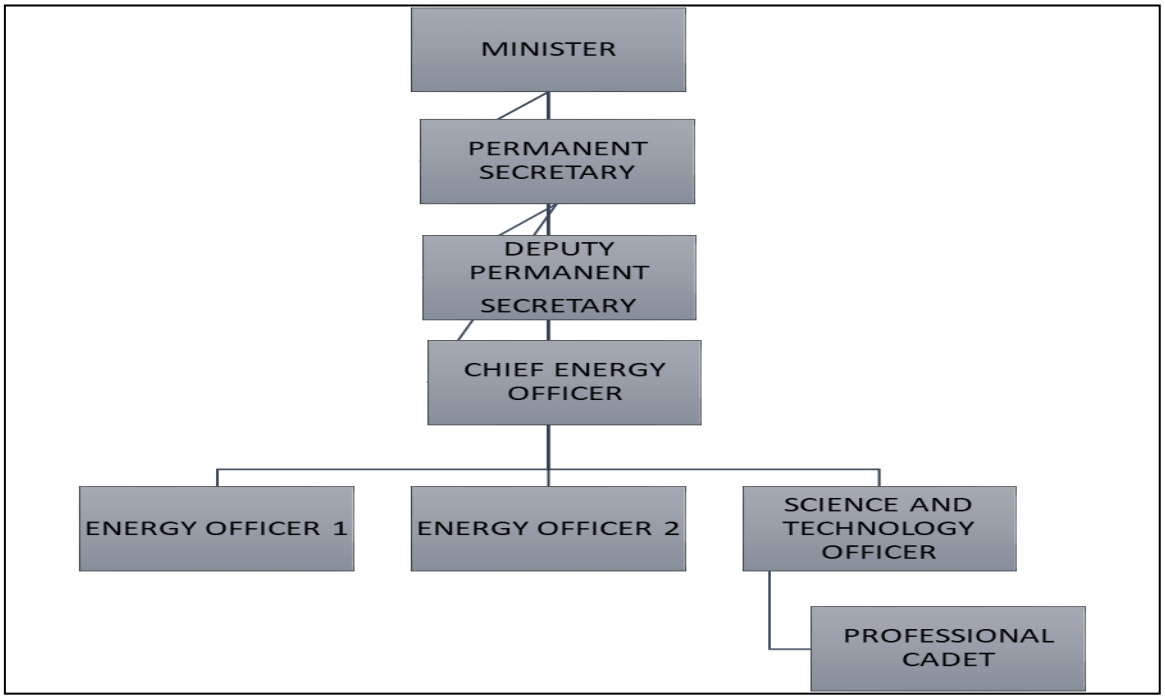

Figure 2 Organizational structure (Source: Renewable Energy Division)

2.1.4 PRODUCTS OFFERED

The Government of Saint Lucia has announced its intention to reduce energy consumption in the public sector by 20% by the year 2020. To realize its objective, the Division of Renewable Energy is focused on renewable energy initiatives through its Concept to Action Project. This encompasses retrofitting government buildings and streets lights with LED lighting; procurement of electric vehicles; design and construction of a 54kWp solar photovoltaic (PV) carport system with EV charging stations as part of a strategy to incorporate sustainable energy into the public sector and explore the feasibility of EV charging via solar energy. Additionally, the Division is exploring the feasibility of geothermal energy development.

2.2 PROJECT MANAGEMENT CONCEPTS

2.2.1 PROJECT

A project is a temporary endeavor undertaken to create a unique product, service or result (PMBOK, 2017). According to PMBOK, fulfillments of product objectives may produce one or more of the following project deliverables:

- A unique product that can either be a component of another item, enhancement or correction to an item or a new item.
- A unique service or a capability to perform a service.
- A unique result such as an outcome or document.
- A unique combination of one or more products, services or results.

Therefore, based on the deliverables above, the Project Management Plan for the Development of Geothermal Energy in St Lucia will produce a unique result in the form of a document.

2.2.2 PROJECT MANAGEMENT

Project Management is defined as the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMBOK, 2017). The Project Management Plan will be accomplished through the appropriate application and integration of project management processes identified in the Project Charter (Appendix 1). It is expected that through the utilization of effective project management practices, the project will meet its objectives and be used as a best practice guide for monitoring and controlling the social and environmental impacts of geothermal energy development.

2.2.3 PROJECT LIFE CYCLE

Project Life Cycle is the series of phases that a project passes through from its start to its completion (PMBOK 2017). PMBOK further details that the project life cycle provides the basic framework for managing the project through project management processes and is applicable regardless of the specific project work involved. For the purpose of this Project Management Plan, the life cycle begins

with the creation of the Project Charter followed by the planning stage to develop and execute the areas in the Charter by using the theoretical and methodological frameworks, tools and techniques to arrive at a conclusion, recommendation and most importantly the results of the project. The delivery of the Final Graduation Document via courier to UCI is expected to close the project.

The Geothermal Project Life Cycle is currently not very well defined, hence a project life cycle for geothermal energy development has been formulated for a better appreciation of the process as reflected in figure 2 below.

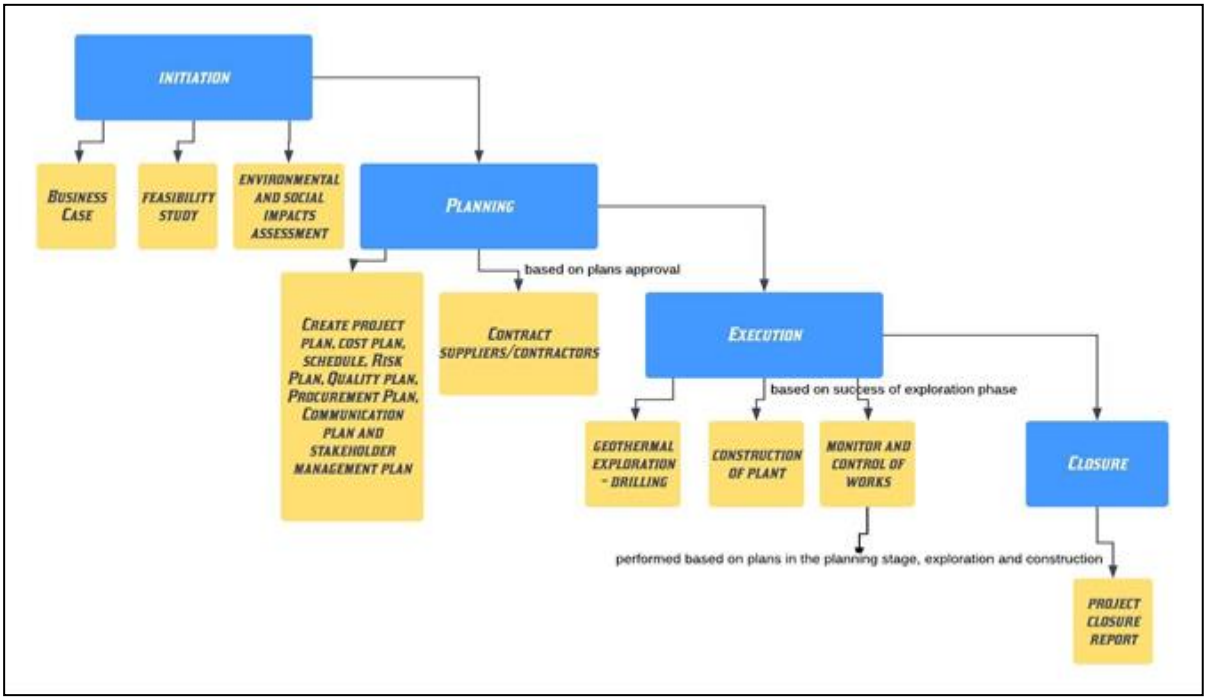

Figure 3 Project Life Cycle Phases – Geothermal Energy Development

In the initiation stage a business case is developed, followed by a feasibility study to determine if the project will be successful in economic terms and whether it would resist all external influences such as social and environmental aspects and legislation/regulations. In the planning and execution phases considerations will be given to the creation of the various plans, exploration (proposed site drillings), construction of plant (based on findings from exploration) through effective

monitoring and control. A project closure report to be issued at the closing of the project.

2.2.4 PROJECT MANAGEMENT PROCESSES

The project life cycle is managed by executing a series of project management activities known as Project Management Processes (PMBOK 2017). PMBOK groups processes into five (5) categories called Process Groups, namely:

- Initiating Process Group – processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase.
- Planning Process Group – processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain objectives.
- Executing Process Group - processes performed to complete the work defined in the Project Management Plan.
- Monitoring and Controlling Process Group – processes required to track, review, and regulate the process, identify areas where changes are required and initiate corresponding changes.
- Closing Process Group – processes performed to formally complete or close the project, phase or contract.

Currently, there is no formal project management template to develop this project. However, the development of a Project Management Plan can give guidance to specific processes such as initiating, planning, monitoring and controlling the social and environmental impact when executing this project.

2.2.5 PROJECT MANAGEMENT KNOWLEDGE AREAS

In addition to the process groups above, processes are also categorized by Knowledge Areas. A Knowledge Area as defined by PMBOK (2017) is an identified area of project management defined by its knowledge requirements and described

in terms of its component processes, practices, inputs, outputs, tools and techniques.

According to PMBOK, there are ten (10) knowledge areas used in project management which include project integration, scope, schedule, cost, quality, human resource, communication, risk, procurement, and stakeholder management. Based on the project scope and its general objective, the FGP will focus on six (6) knowledge areas most relevant in the realization of the project's objectives. These specific knowledge areas were chosen as they will provide a comprehensive baseline to examine the social and environmental impact aspect of the development of geothermal energy. The knowledge areas are as follow:

- Project Scope Management – this will assist the Project Manager to develop a Scope Management plan to define, control and allocate the right amount of work necessary to successfully complete the project.
- Project Schedule Management – this will assist the Project Manager to create a Schedule Management Plan. According to Duggan (2018)[8], effective project scheduling plays a crucial role in ensuring project success. Hence an effective Schedule Management Plan will ensure that realistic time frames are set and the project remains on track.
- Project Cost Management – assist in creating a Cost Management Plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget constraints.
- Project Communications Management – assist the Project Manager in creating a Communication Plan. The Communication Plan sets the standard for how and when communication takes place, increases consistency on how the project is handled, allows the project manager to lead his team to achieve the desired project outcome.
- Project Stakeholder Management – this will assist the Project Manager to develop a Stakeholder Management Plan to identify and categorize project

[8] What Is the Importance of Project Scheduling & Its Role in Business Projects. Retrieved 29 May 2018 from https://yourbusiness.azcentral.com/importance-project-scheduling-its-role-business-projects-9503.html

stakeholders, analyze stakeholders' expectations and develop appropriate strategies for stakeholder engagement.

- Project Risk Management – this will assist the Project Manager to identify and evaluate risks throughout the project life cycle and to implement risk response strategies to mitigate the impact of negative risks and exploit positive risks.

Below (Figure 4) shows the integration of the 6 process groups and the 6 knowledge areas which will be used for the project.

	Project Management Process Groups				
Knowledge Areas	Initiating	Planning	Executing	Monitoring and Control	Closing
Project Scope		Plan Scope Management		Control Scope	
Management		Collect Requirements			
		Define Scope			
Project Schedule		Plan Schedule Management		Control Schedule	
Management		Define Activities			
		Sequence Activities			
		Estimate Activities Duration			
		Develop Schedule			
Project Cost		Plan Cost Management		Control Cost	
Management		Estimate Cost			
		Determine Budget			
Project Communications		Plan Communications Management	Manage Communications	Control Communications	
Management					
Project Stakeholder	Identify Stakeholder	Plan Stakeholder Management	Manage Stakeholder Engagement	Control Stakeholder Engagement	
Management					
Project Risk		Plan Risk Management	Implement Risk Responses	MonitorRisks	
Management		Identify Risks			
		Perform Qualitative Risk Analysis			
		Perform Quantitative Risk Analysis			
		Plan Risk Responses			

Figure 4 Integration of the 6 processes with the 6 knowledge areas

3 METHODOLOGICAL FRAMEWORK

3.1 INFORMATION SOURCES

Information sources as defined by Karibou Connections[9] are the various means by which information is recorded for use by an individual or an organization. It is the means by which a person is informed about something or knowledge is availed to someone, a group of people or an organization. According to Caribou Connections there are three (3) types of information sources, namely primary, secondary and tertiary sources.

For the purpose of this research the focus will be on Primary and Secondary Sources of information.

3.1.1 PRIMARY SOURCES

A Primary Source provides direct or firsthand evidence about an event, object, person or work of art. Primary sources include historical and legal documents, eyewitness accounts, results of experiments, statistical data, pieces of creative writing, audio and video recordings, speeches, and art objects[10].

The Primary Sources of information for the Project Management Plan are as follow:

- Reports on Prefeasibility Study on Geothermal Exploration in St Lucia
- Government Reports on Renewable Energy
- Report on the Environmental and Social Impact Assessment(ESIA) on Geothermal Exploration in St Lucia
- World Bank Reports on Geothermal Development in the Caribbean
- Interviews with members of the Soufriere, Choiseul and Laborie Regions to ascertain their concerns and opinions of the project.

[9] Definition of Information Sources. Retrieved 08 June 2018 from http://karibouconnections.net/medlibafrica/training_module/pdf/module1.pdf

[10] Primary sources definition. Retrieved 05 June 2018 from https://library.ithaca.edu/sp/subjects/primary

- Interviews with consultants working on various aspects of the Geothermal Exploration Project.
- Interview with stakeholder Environmentalists, Conservation and Heritage Organizations.
- Interview with Energy Sector (St Lucia Electricity Services Ltd)
- Focus Group Meetings

3.1.2 SECONDARY SOURCES

Secondary sources describe, discuss, interpret, comment upon, analyze, evaluate, summarize, and process primary sources. Secondary source materials can be articles in newspapers or popular magazines, book or movie reviews, or articles found in scholarly journals that discuss or evaluate someone else's original research[11].

The Secondary Sources of information for the Project Management Plan are as follow:

- Newspaper and Online articles on renewable energy
- Online thesis on ESIA of Geothermal Development in Other Countries
- Articles in Journals on Renewable Energy
- Government Websites
- Key contact person at Renewable Energy Division
- Information from GOSL Technical Meetings
- Other past research relevant to the topic

[11] Secondary sources definition. Retrieved 05 June 2018 from https://library.ithaca.edu/sp/subjects/primary

Chart 1 below depicts the Project Management Plan objectives and corresponding Information Sources.

Chart 1 Information sources (Source: C Fontenelle; Author of the Study)

OBJECTIVES	INFORMATION SOURCES	
	Primary	**Secondary**
To develop a Scope Management Plan to define, control and allocate the right amount of work necessary to successfully complete the project.	• Reports on prefeasibility study on geothermal exploration in St Lucia. • Government reports on renewable energy. • Report on the ESIA on geothermal exploration in St Lucia. • World Bank Reports on Geothermal Energy Development in the Caribbean. • Interviews with members of the Soufriere, Choiseul and Laborie Regions to ascertain their concerns and opinions of the project. • Interviews with consultants working on various aspects of the geothermal exploration project. • Interviews with stakeholder Environmentalists, Conservation and Heritage Organizations. • Interview with Energy Sector (St Lucia Electricity Services Ltd).	• Newspaper and Online articles on Renewable Energy. • Online thesis on Geothermal Development in Other Countries. • Journals on Renewable Energy • Government Websites. • Key contact person at Renewable Energy Division. • Other past research relevant to the topic. • Information from GOSL Technical Meetings.

	• Focus Group Meetings.	
To create a Schedule Management Plan for the management of the project and to ensure that the deliverables are realized within the established time frame.	• ESIA Report. • Organizational Process Assets (OPA).	• Government Website. • Information on GOSL Technical Meetings. • Other past research relevant to the topic.
To create a Cost Management Plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget constraints.	• Interviews with members of the Soufriere, Choiseul and Laborie Regions to ascertain their concerns and opinions of the project. • Interviews with consultants working on various aspects of the Geothermal Exploration Project. • Interviews with Environmentalists, Conservation and Heritage Organizations. • Interview with Energy	• Newspaper and Online articles on Renewable Energy. • Online thesis on Geothermal Development in Other Countries. • Articles in Journals on Renewable Energy. • Government Websites. • Key contact person at Renewable Energy Division. • Information from GOSL Technical Meetings. • Other past research relevant to the topic.

	Sector (St Lucia Electricity Services Ltd). • Focus Group Meetings.	
To develop a Communications Management Plan to ensure that the needs of the project and its stakeholders are met through timely and effective communication.	• Interviews with members of the Soufriere, Choiseul and Laborie Regions to ascertain their concerns and opinions of the project. • Interviews with consultants working on various aspects of the Geothermal Exploration Project. • Interviews with Environmentalists, Conservation and Heritage Organizations. • Interview with Energy Sector (St Lucia Electricity Services Ltd). • Focus Group Meetings. • Report on St Lucia's ESIA on Geothermal Exploration.	• Newspaper and Online articles on Renewable Energy. • Online thesis on Geothermal Development in Other Countries. • Articles in Journals on Renewable Energy. • Government Websites. • Key contact person at Renewable Energy Division. • Information from GOSL Technical Meetings. • Other past research relevant to the topic.

To create a Stakeholder Management Plan to identify and categorize project stakeholders, analyze stakeholders' expectations and to develop appropriate strategies for stakeholder engagement.	• Interviews with members of the Soufriere, Choiseul and Laborie Regions to ascertain their concerns and opinions of the project. • Interviews with consultants working on various aspects of the Geothermal Exploration. Project. • Interviews with stakeholder Environmentalists, Conservation and Heritage Organizations. • Interview with Energy Sector (St Lucia Electricity Services Ltd). • Focus Group Meetings. • Report on the ESIA on Geothermal Exploration in St Lucia.	• Newspaper and Online articles on renewable energy. • Online thesis on geothermal development in other countries. • Articles in Journals on Renewable Energy. • Government Websites. • Key contact person at Renewable Energy Division. • Information on GOSL Technical Meetings. • Other past research relevant to the topic.
To develop a Risk Management Plan to identify and evaluate risks throughout the project life cycle and to implement risk response strategies to mitigate the impact of negative risks and exploit positive risks.	• Brainstorming with project team.	• Reports on risks assessments from previous and similar projects.

3.2 RESEARCH METHODS

A research method is a systematic plan for conducting research[12].

A Business Research Method is defined as a systematic and scientific procedure of data collection, compilation, analysis, interpretation, and implication pertaining to any business problem[13].

For the purpose of this research three (3) methods will be used to realize the Project Management Plan objectives including qualitative, quantitative and analytical research methods.

3.2.1 QUALITATIVE RESEARCH METHOD

Qualitative Research Methods focus on discovering and understanding the experiences, perspectives, and thoughts of participants—that is, qualitative research explores meaning, purpose, or reality (Hiatt, 1986) [14].

3.2.2 QUANTITATIVE RESEARCH METHOD

Quantitative Research Methods attempt to maximize objectivity, replicability, and generalizability of findings, and are typically interested in prediction. Integral to this approach is the expectation that a researcher will set aside his or her experiences, perceptions, and biases to ensure objectivity in the conduct of the study and the conclusions that are drawn[15]. Key features of many quantitative studies are the use of instruments such as tests or surveys to collect data, and reliance on probability theory to test statistical hypotheses that correspond to research questions of interest.

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[12] Definition of Research Methods. Retrieved 07 June 2018 from https://study.com/academy/lesson/research-methodology-approaches-techniques-quiz.html

[13] Definition of Research Method. Retrieved 07 June 2018 from https://research-methodology.net/research-methodology/research-types/

[14] Research Design in Qualitative/Quantitative/ Mixed Methods. Retrieved 05 June 2018 from https://www.sagepub.com/sites/default/files/upm-binaries/41165_10.pdf

[15] Research Design in Qualitative/Quantitative/ Mixed Methods. Retrieved 05 June 2018 from https://www.sagepub.com/sites/default/files/upm-binaries/41165_10.pdf

3.2.3 ANALYTICAL RESEARCH METHOD

In Analytical Research, the researcher has to use facts or information already available and analyze them to make a critical evaluation of the material[16]. SCRIBD further states that analytical research is primarily concerned with testing hypothesis and specifying and interpreting relationships, by analyzing the facts or information already available.

The research methods utilized for the objectives of the Project Management Plan are reflected in Chart 2 below.

Chart 2 Research methods (Source: C Fontenelle; Author of the Study)

OBJECTIVES	RESEARCH METHODS		
	QUALITATIVE	QUANTITATIVE	ANALYTICAL
To develop a Scope Management Plan to define, control and allocate the right amount of work necessary to successfully complete the project.	This method provides insight into planning and controlling the project work to develop the Scope Management Plan through the use of focus group discussions, and in-depth interviews with key stakeholders.	This method provides insight into planning and controlling the project work to develop the Scope Management Plan through the use of simple random sampling in designated regions and through the use of questionnaires (containing questions testing attitudes, closed and open-ended questions).	This method was applied through the use of desk (secondary) research on Geothermal Energy Development in general, and the environmental and social impact of Geothermal Energy Development to aid in developing the Scope Management Plan.
To create a Schedule Management Plan for the	This method was applied through personal interview with Project Manager	No quantitative method was applied to this objective.	This method was applied through the use of desk (secondary) research

[16] Analytical Research retrieved on June 05, 2018 from https://www.scribd.com/doc/33329016/Analytical-Research

management of the project and to ensure that the deliverables are realized within the established time frame.	to ensure the actual development of the schedule is guided by a well thought-out process that will guarantee the effective development of a Schedule Management Plan for the execution of the project within the established time frame.		on Geothermal Energy Development in general, and the environmental and social impact of geothermal energy development to aid in developing the Schedule Management Plan.
To create a Cost Management Plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget constraints.	This method was applied through personal interview with Project Manager to ensure the actual creation of the Cost Management Plan was guided by a well thought-out process and successfully integrated to the project scope and schedule.	No quantitative method was applied to this objective.	This method was applied through the use of desk (secondary) research on Geothermal Energy Development in general, and the environmental and social impact of Geothermal Energy Development to aid in creation of a Cost Management Plan.
To develop a Communications Management Plan to ensure that the needs of the project and its stakeholders are met through timely and effective communication.	This method provides insight into the structure and methods of information collection through the use of instruments such as interviews, focus group discussions, and the processes necessary to facilitate the critical links among stakeholders, ideas, and information critical to the project success.	This method provides insight into the structure and methods of information collection through the use of instruments such as random sampling and questionnaires and the processes necessary to facilitate the critical links among stakeholders, ideas and data relevant to the project	This method was applied through the use of desk (secondary) research on Geothermal Energy Development in general, and the environmental and social impact of Geothermal Energy Development to aid in creation of a Communications Management Plan.

		success.	
To create a Stakeholder Management Plan to identify and categorize project stakeholders, analyze stakeholders' expectations and to develop appropriate strategies for stakeholder engagement.	This method provides insight into the creation of a Stakeholder Management Plan by categorizing the structure and methods utilized in the identification of community members, consultants, environmentalists, heritage and conservation organizations that could affect or be affected by the project, to analyze their expectations and their impact on the project, and to develop appropriate strategies and tactics for effectively engaging them in a manner appropriate to the their interests and involvement in the project. Instruments utilized in this method include interviews and focus group discussions.	This method provides insight into the creation of a Stakeholder Management Plan by categorizing the structure and methods utilized in the identification of community members, consultants, environmentalists, heritage and conservation organizations that could affect or be affected by the project, to analyze their expectations and their impact on the project, and to develop appropriate strategies and tactics for effectively engaging them in a manner appropriate to the their interests and involvement in the project. Instruments utilized in this method include Questionnaires and Random Sampling.	This method was applied through the use of desk (secondary) research on Geothermal Energy Development in general, and the environmental and social impact of Geothermal Energy Development to aid in creation of a Stakeholder Management Plan.
To develop a Risk Management Plan to identify and evaluate risks throughout the project life cycle and to implement	This method was applied through brainstorming sessions with the Project Team where the Project Team created a list of	No quantitative method was applied to this objective.	This method was applied through use of the past experience of the project team, and ESIA experts to aid in identifying potential

risk response strategies to mitigate the impact of negative risks and exploit positive risks.	everything that could go wrong with the project.		risks on the project.

3.3 TOOLS

A Tool is defined as “something tangible, such as a template or software program, used in performing an activity to produce a product or result” (PMBOK Guide 2017, p. 725).

A number of Tools defined in the PMBOK Guide (2017) were utilized in the different objectives of the Project Management Plan as depicted in Chart 3 below.

Chart 3 Tools (Source: C Fontenelle: Author of the Study)

OBJECTIVES	TOOLS
To develop a Scope Management Plan to define, control and allocate the right amount of work necessary to successfully complete the project.	Tools utilized under the **Plan Scope Management** process included (1) Expert Judgement (information from experts on the Social and Environmental Impact Assessment for the Geothermal Energy Exploration Program in St Lucia and Successful Geothermal Energy Development in Other Countries), and (2) Meetings with stakeholders relevant for realizing the scope of the project. Tools utilized under the **Collect requirements** were (1) Data Gathering (interviews, focus groups, questionnaires); (2) Data Analysis (document analysis - analysis of secondary data). Tools utilized under the **Define scope** included (1) Expert Judgement (from consultants working on similar project and environmentalists); (2) Data Analysis. Tools used under the **Create Work Breakdown Structure (WBS)** were (1) Expert Judgement and (2) Decomposition**.** Tool used to **Validate Scope** was Inspection (to ensure deliverables met requirements).

	Tool used to **Control Scope** was Data Analysis (which included Variance Analysis – to determine the cause and degree of difference between the baseline and actual performance of the project and to maintain control over the project).
To create a Schedule Management Plan for the management of the project and to ensure that the deliverables are realized within the established time frame.	Tools used for the **Plan Schedule Management** included (1) Expert Judgement (to assist with the development, management and control of schedule and schedule software); (2) Data Analysis (through the use of Rolling Wave Planning); (3) Meetings (to develop schedule with Project Team/stakeholders). Tools used to **Define Activities** included (1) Roll Waving Planning (to ensure that work activities move forward on current and near-term deliverables while planning is still ongoing for future work packages); (2) Decomposition (to ensure that project scope is divided into smaller work activities to ensure deliverables are managed and realized); (3) Meetings (with experts to define the activities needed to complete the project). Tool used in **Sequence Activities** was Dependency determination and Integration (through the use of discretionary dependencies which is based on best practices to identify and document relationships among project activities). Tools used in **Estimate Activities Duration** were (1) Analogous Estimating (through the use of historical data from similar projects to estimate duration of activities); (2) Data Analysis (through the use of Reserve Analysis to account for schedule uncertainties). Tool used to **Develop Schedule** included Schedule Compression (through the use of fast tracking where activities normally done in sequence can be done in parallel for at least a portion of the duration). The Tool used to **Control Schedule** was Data Analysis through Earned Value Analysis which provides a method that will allow the project to be measured by progress achieved.
To create a Cost Management Plan to define the processes for managing and controlling the budget and to	Tools utilized under the **Plan Cost Management** process included (1) Expert Judgment (to assist with cost estimating and budgeting) and (2) Meetings to develop the Cost Management Plan. Tools used to **Estimate Costs** included (1) Bottom Up Estimating (to develop estimates at the task level in WBS); (2) Data Analysis to include Reserve Analysis to account for cost uncertainties.

ensure that the project is completed within the budget constraints.	The Tool used to **Determine Budget** was Cost Aggregation to sum the costs for each work package to the control account up to the project level. Tools used to **Control Costs** included (1) Earn Value Analysis to compare the performance measurement baseline to the actual cost performance) and (2) Variance Analysis to determine the cause of any variance.
To develop a Communications Management Plan to ensure that the needs of the project and its stakeholders are met through timely and effective communication.	Tools utilized for **Plan Communications Managemen**t included Expert Judgement (with communications consultant and other stakeholders working on similar projects); (2) Communications Requirement Analysis (used for determining the communication channel and stakeholder information and communications requirements); (3)Communications Technology (used to transfer information to stakeholders which includes meetings and emails; (4) Interpersonal and Team Skills (which includes communications styles assessment used to identify preferred communication method, format and content or planned communications activities; (5) Data Presentation; (6) Meetings with Project Team to update communications project information. Tools utilized for **Manage Communications** included (1) Communications Method to allow flexibility in communicating to stakeholders; (2) Communications Skills which include communication competence – ensuring that there is clarity and purpose in key messages; effective relationship building and information sharing; (3) Meetings to refine actions in Communications Strategy/Plan. The Tool utilized in **Monitor Communications** was Data Representation by reviewing changes between desired and current engagements and adjusting communications as necessary.
To create a Stakeholder Management Plan to identify and categorize project stakeholders, analyze stakeholders' expectations and to	Tools used to **Identify Stakeholders** included (1) Expert Judgement – knowledge sought on renewable energy; (2) Data Gathering – from interviews, focus groups, questionnaires; (3) Data Analysis (creation of a stakeholder analysis); (4) Data Representation through the use of a Power/Influence Grid and Directions of Influence. The Tool used to **Plan Stakeholder Engagement** was Data Representation through the use of Stakeholder Prioritization Matrix.

develop appropriate strategies for stakeholder engagement.	The Tool used in the **Manage Stakeholder Engagement** was Communications Skills to collect feedback on meetings, conversations, and issue identification and discussions. The Tool used in the **Monitor Stakeholder Engagement** was Meeting to monitor and assess stakeholders' engagement levels by using information from the Stakeholder Engagement Plan.
To develop a Risk Management Plan to identify and evaluate risks throughout the project life cycle and to implement risk response strategies to mitigate the impact of negative risks and exploit positive risks.	Tools used for **Plan Risk Management and Identify Risks** included (1) Expert Judgement; this includes environmentalists and project managers who have conducted similar risks exercises and (2) Meetings to include brainstorming sessions on potential risks at every stage of the project. The Tool used to **Perform Qualitative Risks** was the Risk Categorization which was based on the sources of the risks. The Tool used for **Plan Risk Responses** was the Strategies for overall Project Risks to address overall project risks. The Tool used for **Implement Risks Responses** was the Project Management Integration System which ensured that the agreed upon Risks Response Plans for the schedule and costs are integrated into the project. The Tool utilized to **Monitor Risks** was Audits to consider the effectiveness of the Risk Management Process at various stages of the project.

3.4 ASSUMPTIONS AND CONSTRAINTS

An Assumption as defined by PMBOK (2017) is a factor in the planning process that is considered to be true, real, or certain, without proof or demonstration.

A Constraint as defined by PMBOK (2017) is a limiting factor that affects the execution of a project, program, portfolio, or process. PMBOK further states that projects operate within the constraints imposed by the organization through their structure and governance framework. Chart 4 below depicts the Project Management Plan objectives with corresponding Assumptions and Constraints.

Chart 4 **Assumptions and Constraints (Source: C Fontenelle – Author of the study)**

OBJECTIVES	ASSUMPTIONS	CONSTRAINTS
To develop a Scope Management Plan to define, control and allocate the right amount of work necessary to successfully complete the project.	• All stakeholders will be available to provide information to successfully complete the project. • Community members will willingly participate in the qualitative and quantitative research. • The Division of Renewable Energy will support this project and provide relevant information. • Project scope may change during the project life cycle.	• A substantial amount of work to complete the Scope Management Plan must be accomplished within the established schedule.
To create a Schedule Management Plan for the management of the project and to ensure that the deliverables are realized within the established time frame.	• The time allocated for the completion of activities within the Project Management Plan will be sufficient for the completion of the project. • Timely gathering of primary and secondary research.	• Any delays in obtaining relevant information for the project will impede schedule delivery.
To create a Cost Management Plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget constraints.	• Overall Cost may be affected due to external or internal factors. • The budget allocated to conduct research will be sufficient. • Overall economic conditions will remain the same.	• Completion of project scope must be within available budget.
To develop a Communications Management Plan to ensure that the needs of the project	• Information provided in the project management plan will be adequately understood and correctly interpreted by stakeholders.	• Effective and various methods of communication must be utilized

OBJECTIVES	ASSUMPTIONS	CONSTRAINTS
and its stakeholders are met through timely and effective communication.	• The needs of the project and its stakeholders will be met through timely and effective communication.	and must be available to reach relevant stakeholders.
To create a Stakeholder Management Plan to identify and categorize project stakeholders, analyze stakeholders' expectations and to develop appropriate strategies for stakeholder engagement.	• Stakeholders will be accurately identified. • Stakeholders' expectations will be effectively analyzed. • Appropriate strategies will be developed for effective stakeholder engagement.	• Lack of willingness to participate in qualitative and quantitative research. • Limitations of stakeholders to provide relevant information.
To develop a Risk Management Plan to identify and evaluate risks throughout the project life cycle and to implement risk response strategies to mitigate the impact of negative risks and exploit positive risks.	• The risks will be adequately identified. • The Risk Management Plan will be effective enough to detect and mitigate risks.	• Lack of experience of Project Manager to perform audits at the right time to mitigate risks.

3.5 DELIVERABLES

A Project Deliverable is defined as a unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project (PMBOK, 2013). Deliverables are the products or services that the project delivers to stakeholders.

Deliverables for the Project Management Plan are provided in Chart 5 below and are based on objectives listed in the Charter.

Chart 5 Deliverables (Source – C. Fontenelle; author of study)

OBJECTIVES	DELIVERABLES
To develop a Scope Management Plan to define, control and allocate the right amount of work necessary to successfully complete the project.	A detailed Scope Management Plan on work/activities needed to be carried out to determine the environmental and social factors to be considered for Geothermal Energy Development in St Lucia.
To create a Schedule Management Plan for the management of the project and to ensure that the deliverables are realized within the established time frame.	A Schedule Management Plan to provide guidance and direction on how the project schedule will be managed throughout the project in order that the project scope is achieved within the specified time frame.
To create a Cost Management Plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget constraints	A Cost Management Mlan to provide the planning and structure necessary to manage and control the costs of the project, and keep costs within the limits of the budget.
To develop a Communications Management Plan to ensure that the needs of the project and its stakeholders are met through timely and effective communication	A Communications Management Plan to detail the communications requirement of the project to include information sharing, collection and collation of information and methods/channels of communication.
To create a Stakeholder Management Plan to identify and categorize project stakeholders, analyze stakeholders'	A Stakeholder Management Plan to provide the appropriate management strategies to effectively engage stakeholders throughout

expectations and to develop appropriate strategies for stakeholder engagement	the lifecycle of the project, based on the analysis of their needs, interests and potential impact on project success.
To develop a Risk Management Plan to identify and evaluate risks throughout the project life cycle and to implement Risk Response Strategies to mitigate the impact of negative risks and exploit positive risks	A Risk Management Plan to provide a documented plan for identifying, analyzing, and prioritizing risks and to identify the risk management strategies for both negative and positive risks.

4 RESULTS

4.1. SCOPE MANAGEMENT PLAN

4.1.1 INTRODUCTION

The objective of the Scope Management Plan is to define, control and allocate the right amount of work necessary to successfully complete the project. This entails conducting literature review and field studies on the Environmental and Social Factors of Geothermal Energy Development to ascertain its impact on a community and national level. The field study will be conducted within six (6) months to commence February 01, 2019 in the areas proposed for the geothermal exploration in St Lucia, namely Soufriere, Choiseul, and Laborie.

The scope of the work for the Project Management Plan includes an examination of (1) Environmental Impact of Geothermal Energy Development which comprises of factors such as water quality, air quality, noise level, geology/soil, natural habitats and bio-diversity and (2) Social Impact to include factors such as displacement and disputes over land rights, the rights of indigenous people, impact on livelihood and well-being of farmers and community members, short-term disruptions such as traffic, noise pollution, depletion of water supply, loss of recreational facility, stakeholder engagement and consultation.

The preliminary meeting will convene at the Community Centers in the 3 different locations to brief the public on the project. The goal is to engage at least 100 participants from each community in the geothermal energy discussion. Thereafter, the Project team will utilize various research instruments to realize the project objectives which include meetings, interviews, focus groups discussion, gathering of technical information and questionnaires for technical data collection as well as community feedback.

4.1.2 SCOPE MANAGEMENT APPROACH

The Scope Management Approach will address the following processes and procedures used to manage the scope of the project:

- Plan Scope Management using Expert Judgment by sourcing information from experts on the Social and Environmental Impact Assessment for the Geothermal Energy Exploration Program in St Lucia and Successful Geothermal Energy Development in Other Countries, and (2) Meetings with stakeholders relevant for realizing the scope of the project.
- Collect Requirements using data gathered from interviews, focus groups and questionnaires and data analysis of secondary research.
- Define Scope using knowledge from key consultants involved in the Geothermal Energy Development Project and data analysis through use of the survey instruments.
- Create WBS using Decomposition to subdivide the project into smaller components; and Expert Judgement.
- Validate Scope through Inspection to ensure that deliverables meet requirements.
- Control Scope through Variance Analysis Techniques to determine the cause and degree of difference between the baseline and actual performance of the project and to maintain control over the project.

The interconnection of the above processes and continuous monitoring and control allows for the effective management of the project scope. The Project Manager in consultation with key relevant stakeholders is responsible for producing the Scope Management Plan. The Project Sponsor manages, documents and measures progress of project works through the use of templates developed for this project. Any request for changes to the scope will be authorized by the Sponsor, however the Project Manager is responsible for evaluating the change request to ensure that deliverables are not significantly impacted.

4.1.3 ROLES AND RESPONSIBILITIES

The Project Sponsor, Project Manager and Project team are instrumental in managing the scope for the realization of the deliverables within the established budget and schedule. For the effective management of the project, the roles and responsibilities of the Project Team are defined in Chart 6 below.

Chart 6 Roles and Responsibilities of Project Team (Source – C. Fontenelle; author of study)

NAME	ROLE	RESPONSIBILITY
Michael Pistone	Project Sponsor	• Approves Scope Management Plan. • Reviews escalated scope issues and provides direction for resolution. • Approves major scope change requests. • Overall decision-making responsibility for Scope Management activities. • Effectively communicates with key stakeholders. • Provides necessary resources. • Deals directly with the Project Manager. • Approves key project deliverables.
Cynthia Fontenelle	Project Manager	• Overall responsibility for Scope Management. • Oversees the development of the Scope Management Plan. • Oversees the Scope Change Management process. • Approves scope change requests within her authority. • Responsible for accomplishing project objectives and all associated outcomes within scope, cost, time and quality specifications. • Escalates scope and change issues. • Ensures that scope changes are incorporated into appropriate project documents. • Oversees day-to-day execution, and monitors progress. • Brings the project to a close, and captures the lessons learned.

NAME	ROLE	RESPONSIBILITY
Carlton Smith Johana Potton Mesa Barton Leona Markesan	Project Team (Technical)	• Recommending and guiding methodologies involving data collection, criteria, and analysis. • Preparing and reviewing technical project reports. • Undertake habitat mapping of bio-diversity at the 3 locations with concentration on endangered species. • Undertake baseline noise monitoring at the 3 locations. • Undertake baseline air quality monitoring at the 3 locations. • Undertake baseline water quality inspection at the 3 locations. • Undertake baseline study on potential soil erosion due to drilling.
Marva Hornstone Kevon Jacobson Lemon Sunga	Project Team (Non-Technical)	• Assist Project Manager with her duties. • Support and provide insight with respect to community issues and regulations. • Prepare map of land ownership and use, supported by desk-based profile of the land owners or users (for monitoring livelihood restoration), or land use rights transfer procedures. • Review historical data on volcanic hazards and seismic activities. • Undertake assessment of the impact or short- term disruptions to farmers and community members in terms of traffic, depletion of water supply, loss of recreational facility. • Undertake survey of number of inhabitants in each community and those likely to be affected. • Undertake community perception survey: their fears about the future of their community, and their aspirations for their future and the future of their children. • Engage stakeholders at different phases of the project life cycle • Assist Project Manager with any other duties as assigned.
Mark Jhansi	Project Scheduler	• Assists in the development of the Schedule Management Plan. • Responsible for the daily schedule-related analysis and update activities.

NAME	ROLE	RESPONSIBILITY
		• Leads the schedule management activities, communicates schedule status, maintains the project schedule and provides updates. Makes schedule risk, issue and change upon recommendations from the Project Manager.
Mark Knight	Project Finance Manager	• Preparation and maintenance of the Project Budget to ensure data is complete and maintained on a timely basis. • Prepare and regularly update the spending plan. • Review Payment by Results (PBR) requirements and ensure targets and milestones are in alignment with payment schedule. • Review fee rate calculations and ensure recording in the ledger aligns with reporting requirements.

4.1.4 SCOPE MANAGEMENT PROCESSES

4.1.4.1 DEFINE SCOPE

The deliverable of the Scope Management Plan is a report on the development of a Project Management Plan that will provide valuable and insightful information and guidance for further discussion and research on the Environmental and Social Impact of Geothermal Energy Development in St Lucia. The Project Manager will use expert judgement and data analysis from similar projects to examine two (2) pertinent areas relevant to achieving the project scope, namely:

1. **Environmental Impact Assessment** which provides a systematic and holistic process that allows stakeholders to better understand the environmental impact of the proposed project and is expected to examine factors such as:

- Baseline Noise Monitoring Survey at the 3 identified locations and nearby locations which can be affected by noise emissions during drilling.
- Baseline Air Quality Monitoring Surveys at the 3 identified locations as well as touristic sites and households nearby which can be affected by the air emissions from drilling and receptors.
- Baseline Water Quality Inspection to carefully identify water sources and uses to aid in alleviating contamination and health issues.
- Habitat Mapping of Bio-diversity at the 3 locations for the preservation of flora, fauna and endangered species.
- Consultation with the St. Lucia Archaeological and Historical Society on natural sites or artifacts that symbolize cultural values such as Amerindian terraces, sacred graves, rocks, lakes, waterfalls and other forms of non-tangible cultural heritage.
- Review of historical data on volcanic hazards and seismic activities.
- Baseline study on potential soil erosion due to drilling or while grading the areas for preparation for drilling.

2. **Social Impact Assessment** which examines the social consequences likely to follow before, during and after the Geothermal Energy Development and includes investigations of factors such as:
    - Perception Survey - solicitation and accommodation of the views, concerns and recommendations from grassroots communities and stakeholder groups within the project area, especially as they relate to likely or perceived environmental and social impacts of the project.
    - Baseline information of livelihood and standards of living of residents and potential impact of loss.
    - Baseline information with respect to community issues and regulations.
    - Survey on land ownership and land use.

- Survey of the impact or short-term disruptions to farmers and community members in terms of traffic, depletion of water supply, loss of recreational facility.

4.1.4.2 CREATE WBS AND WBS DICTIONARY

Work Breakdown Structure

PROJECT TITLE	Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia	**SPONSOR**	Michael Pistone
PROJECT MANAGER	Cynthia Fontenelle	**DATE**	30-Aug-18

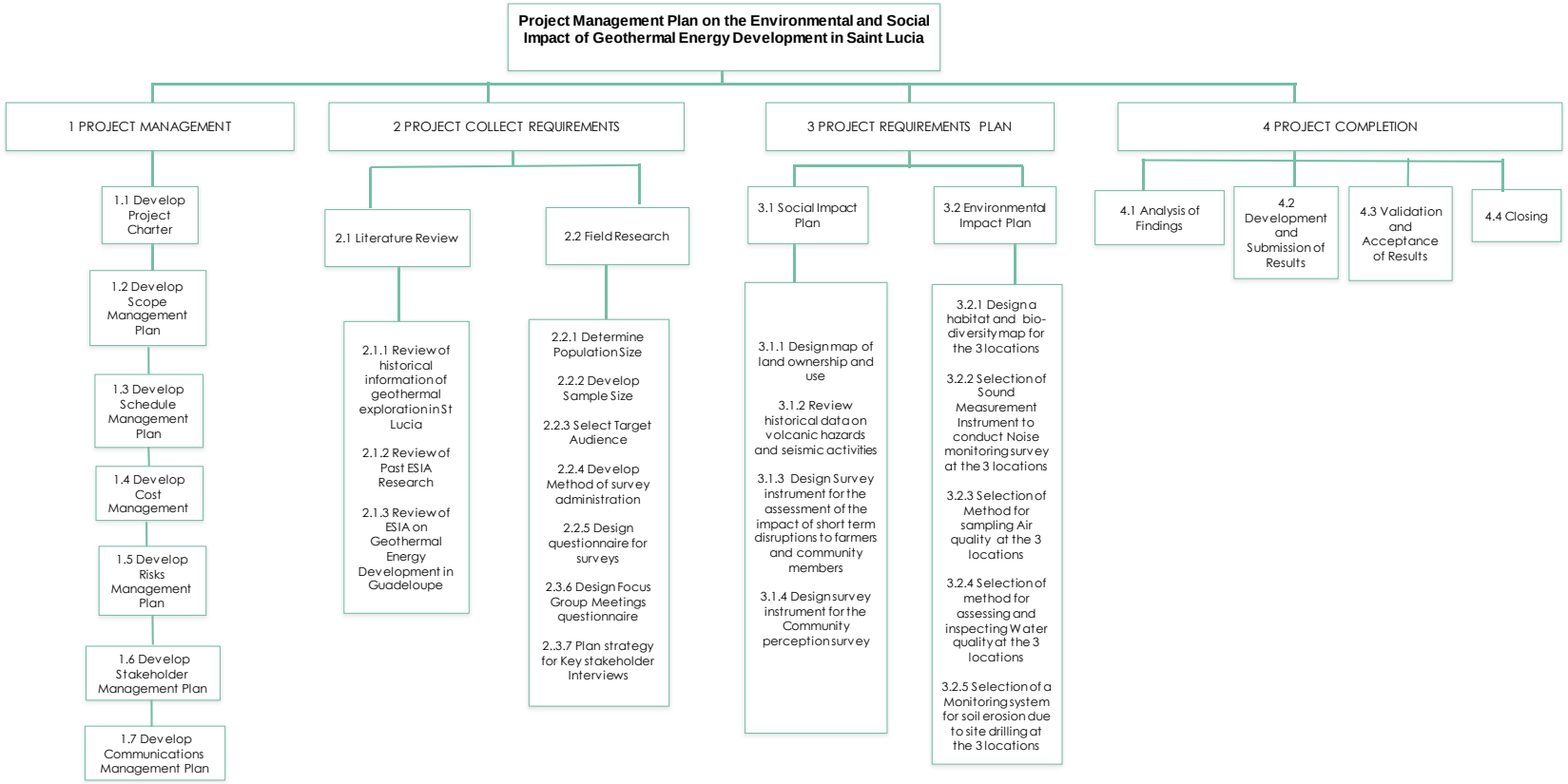


Figure 5 Work Breakdown Structure for the Project Management Plan

The above WBS for the Project Management Plan depicts a hierarchical decomposition of the total scope of work to be carried out in fulfillment of the project deliverables. It includes the project collect requirement which examines the literature review and field research methods; and the project requirement plan which details the areas of concentration to develop the Environmental and Social Impact Plan to realize the project objectives. Additionally, the decomposition of works makes it easier for the project team to subsequently estimate required budget, create a realistic schedule, and control each stage of the project. Subsequently, the creation of a WBS Dictionary (Appendix 4) provides detailed information about deliverables, further breakdown of tasks in the WBS with corresponding unique identification codes and resources needed to define the total scope of the project.

4.1.4.3 VALIDATE SCOPE

The Project Sponsor is accountable for formalizing acceptance of the completed project scope deliverable. However, the project scope must be inspected by the Project Manager prior to submitting to the Project Sponsor. Tasks which do not meet specifications during inspection will be re-assigned to respective team members for amendment. This provides a means of monitoring to ensure that project work is consistently kept within scope and specified changes are made at timely intervals. Upon approval, the Project Sponsor and Manager sign off on a Project Deliverable Acceptance Document (copy attached in Appendix 5 for reference) which will be the only acceptable document used when deliverables meet the respective acceptance criteria.

4.1.4.4 CONTROL SCOPE

The Project Team is responsible for monitoring and controlling the approved scope baseline throughout the project life cycle. It is also the responsibility of the Project Manager and his team to ensure that only the work stipulated in the WBS is performed to allow for the successful completion of the project. The WBS and WBS

Directory will be used to record which tasks change and determine how changes will influence the deliverables. The Project Manager is accountable for the revision of weekly status progress reports submitted by team members to ensure project works progresses as planned and only changes that were processed in accordance with the agreed upon procedures are implemented. A Variance Analysis should be undertaken to measure the project's progress and corrective actions applied to any proposed changes that affect the project performance. Application of best practices for documenting and controlling the scope of work on the project is essential to successfully manage scope changes. Hence, any changes to scope will be done through a Change Request Form (seen in Appendix 6) and must be authorized by the Project Manager and accepted by the Project Sponsor. Additionally, the Project Manager should ensure that the project team completely understands the additional work and its importance; and updates the project scope statement, WBS, WBS dictionary, database, schedule and budget for the successful integration of the changes.

4.1.5 MEASURES OF PROJECT SUCCESS

The success of the Project Management Plan will ultimately be dependent on the development and implementation of an effective Scope Management Plan and the effective management of scope changes. However, the following factors will also affect the project's success:

- The ability of the project to meet schedule – the Project Team should update schedule at least once weekly and evaluate milestones at the end of every stage of the project life cycle to check they are scheduled as planned and to allow for the correction of any slippages that can severely impact the overall project timescales.
- The ability of the project to remain on budget – as the Project Team examines the milestones, the cost should also be analyzed against the deliverables to ascertain that the budget is within the stipulated budget.

- Stakeholder Satisfaction – the ability of the Project Manager to engage stakeholders at every stage of the project and to positively influence their behavior so they can remain supportive.
- The power and ability of the Project Sponsor to provide the resources needed for the execution of the project.
- Implementation of an effective Communications Plan – the ability of the Project Team to carefully execute the Communications Plan to successfully reach stakeholders.
- The ability of the Project Manager to complete the project and submit the report within the stipulated time frame.

4.2. SCHEDULE MANAGEMENT PLAN

4.2.1 INTRODUCTION

The purpose of the Schedule Management Plan is to define the approach needed for the team to develop the project schedule. The Project Manager and Scheduler along with the team will develop the schedule to reflect the project baseline schedule duration of 52 days, to include methods for planning, documenting and prioritizing the required project work, and the selection of applicable tools and techniques for monitoring and controlling throughout the project life cycle to successfully realize deliverables. Subsequently, any changes will be managed through a Change Control process authorized by the Sponsor. It is the responsibility of the Project Manager to report to the Project Sponsor any deviations as well as provide options to correct deviations.

4.2.2 SCHEDULE MANAGEMENT PLAN APPROACH

The Schedule Management Approach provides guidance on the following processes and procedures needed to manage the project schedule:

- Plan Schedule Management is the process of establishing the procedures and documentation for planning, developing, managing, executing and controlling the project schedule by using Expert Judgement (to assist with the development, management and control of the schedule and schedule software) and Meetings (to develop the schedule with project team/stakeholders).

- Define Activities using Roll Waving Planning (to ensure that work activities move forward on current and near-term deliverables while planning is still ongoing for future work packages); Decomposition (to ensure that project scope is divided into smaller work activities to ensure deliverables are managed and realized); Meetings (with team experts to define the activities needed to be performed to complete the project).

- Sequence Activities using Dependency Determination and Integration (through the use of discretionary dependencies which is based on best practices to identify and document relationships among project activities and to determine the order of work packages).

- Estimate Activities to determine the number of work periods needed to complete individual activities with stipulated project resources using Analogous Estimating (through the use of historical data from similar projects to estimate duration of activities); and Data Analysis (through the use of Reserve Analysis to account for schedule uncertainties).

- Develop Schedule is the process of analyzing activity sequencing, resource requirements, durations and schedule constraints to create the project schedule using Schedule Network Analysis with the Critical Path Method to determine through the network diagram earliest and latest time when an activity can start and end. In the event that the project has deviated considerably from the baseline, the Project Manager will apply the Schedule Compression technique through the use of fast tracking where activities normally done in sequence can be done in parallel for at least a portion of the duration.

- Control Schedule using Data Analysis which includes Performance Reviews to measure, analyze and compare performance against schedule baseline; and Variance Analysis to measure planned versus actual start and finish dates and planned versus actual durations.

Project schedules will be made using Microsoft Project 2016. Once the initial schedule has been developed, the Project Manager will carefully assess it to review assigned project tasks and ensure that the Project Team agrees to the proposed work package assignments, durations, and schedule. Thereafter the Project Sponsor will review and approve the schedule.

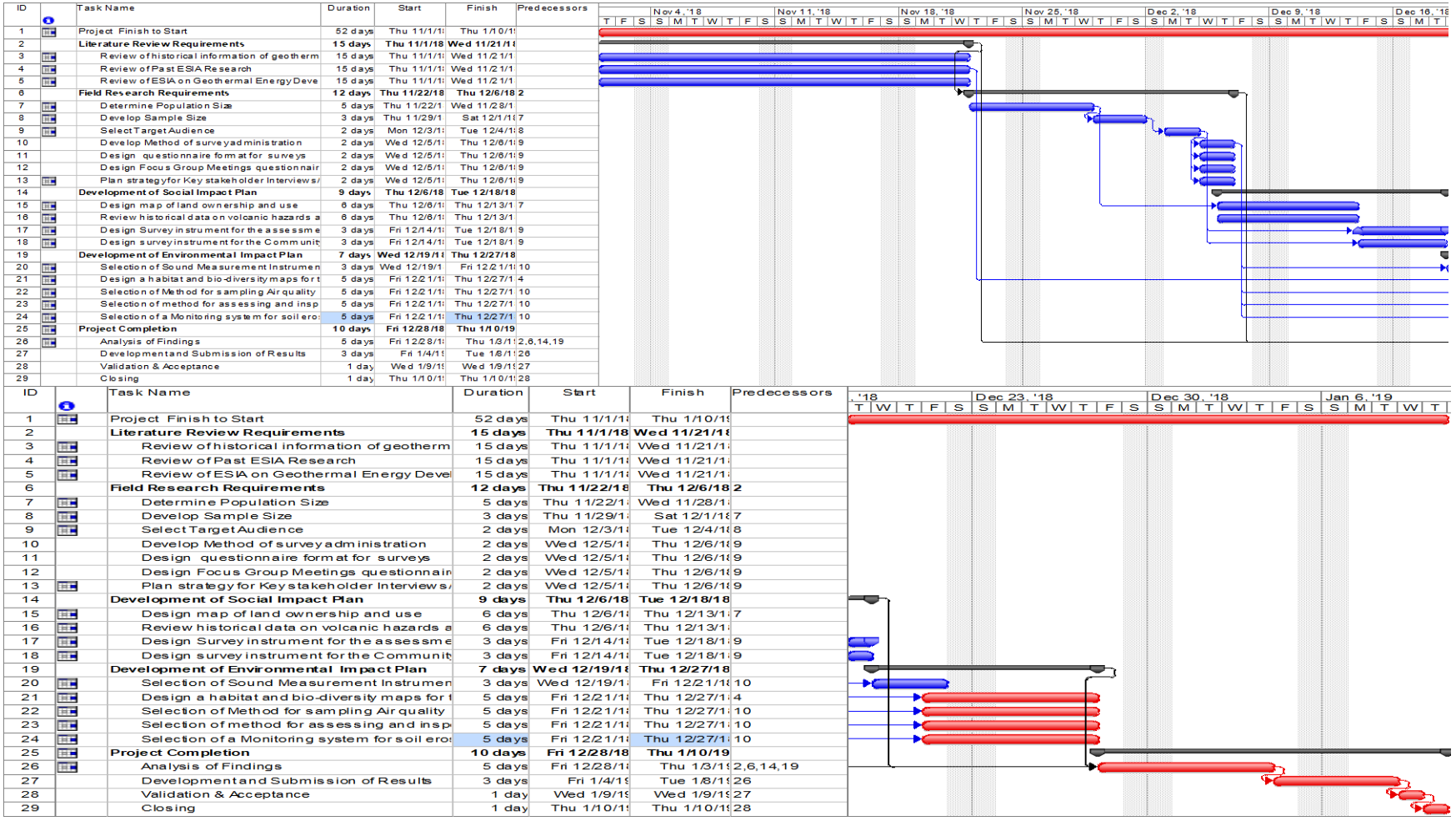
4.2.2 SCHEDULE MANAGEMENT PLAN PROCESS

4.2.2.1 DEFINE ACTIVITIES

In defining the activities, the Project Manager will go through a process of identifying and documenting the specific actions to be performed to produce the project deliverables. This entails thoroughly examining the WBS and WBS Dictionary found in the Scope Management Plan to develop the activity list. The Schedule Activity List attached in Appendix 7 provides an itemized documentation of all of the scheduled activities that are part of the project and includes a detailed description of the activity, the unique activity identifier, and a list of project team members assigned to that particular activity. The activity list has been prepared in advance to allow team members adequate time for review. Additionally, the Project Manager will develop a project milestone list (as reflected in Appendix 8) for guidance on achievements of key activities and to verify the progress of the project.

4.2.2.2 SEQUENCE ACTIVITIES

To determine the sequences of the activities, the Project Manager identifies and documents relationships within the project to define the logical sequence of work to obtain the greatest efficiency, given all of the project's constraints. The Activity List developed in the above section forms the basis for sequencing the activities with a finish-to-start relationship as depicted in Figures 6 and 7 below.



ID	Task Name	Duration	Start	Finish	Predecessors
1	Project Finish to Start	52 days	Thu 11/1/18	Thu 1/10/19	
2	**Literature Review Requirements**	**15 days**	**Thu 11/1/18**	**Wed 11/21/18**	
3	Review of historical information of geotherm	15 days	Thu 11/1/18	Wed 11/21/18	
4	Review of Past ESIA Research	15 days	Thu 11/1/18	Wed 11/21/18	
5	Review of ESIA on Geothermal Energy Deve	15 days	Thu 11/1/18	Wed 11/21/18	
6	**Field Research Requirements**	**12 days**	**Thu 11/22/18**	**Thu 12/6/18**	2
7	Determine Population Size	5 days	Thu 11/22/18	Wed 11/28/18	
8	Develop Sample Size	3 days	Thu 11/29/18	Sat 12/1/18	7
9	Select Target Audience	2 days	Mon 12/3/18	Tue 12/4/18	8
10	Develop Method of survey administration	2 days	Wed 12/5/18	Thu 12/6/18	9
11	Design questionnaire format for surveys	2 days	Wed 12/5/18	Thu 12/6/18	9
12	Design Focus Group Meetings questionnair	2 days	Wed 12/5/18	Thu 12/6/18	9
13	Plan strategy for Key stakeholder Interviews/	2 days	Wed 12/5/18	Thu 12/6/18	9
14	**Development of Social Impact Plan**	**9 days**	**Thu 12/6/18**	**Tue 12/18/18**	
15	Design map of land ownership and use	6 days	Thu 12/6/18	Thu 12/13/18	7
16	Review historical data on volcanic hazards a	6 days	Thu 12/6/18	Thu 12/13/18	
17	Design Survey instrument for the assessme	3 days	Fri 12/14/18	Tue 12/18/18	9
18	Design survey instrument for the Community	3 days	Fri 12/14/18	Tue 12/18/18	9
19	**Development of Environmental Impact Plan**	**7 days**	**Wed 12/19/18**	**Thu 12/27/18**	
20	Selection of Sound Measurement Instrumen	3 days	Wed 12/19/18	Fri 12/21/18	10
21	Design a habitat and bio-diversity maps for t	5 days	Fri 12/21/18	Thu 12/27/18	4
22	Selection of Method for sampling Air quality	5 days	Fri 12/21/18	Thu 12/27/18	10
23	Selection of method for assessing and insp	5 days	Fri 12/21/18	Thu 12/27/18	10
24	Selection of a Monitoring system for soil ero	5 days	Fri 12/21/18	Thu 12/27/18	10
25	**Project Completion**	**10 days**	**Fri 12/28/18**	**Thu 1/10/19**	
26	Analysis of Findings	5 days	Fri 12/28/18	Thu 1/3/19	2,6,14,19
27	Development and Submission of Results	3 days	Fri 1/4/19	Tue 1/8/19	26
28	Validation & Acceptance	1 day	Wed 1/9/19	Wed 1/9/19	27
29	Closing	1 day	Thu 1/10/19	Thu 1/10/19	28

Figure 6 Sequence Activities Schedule

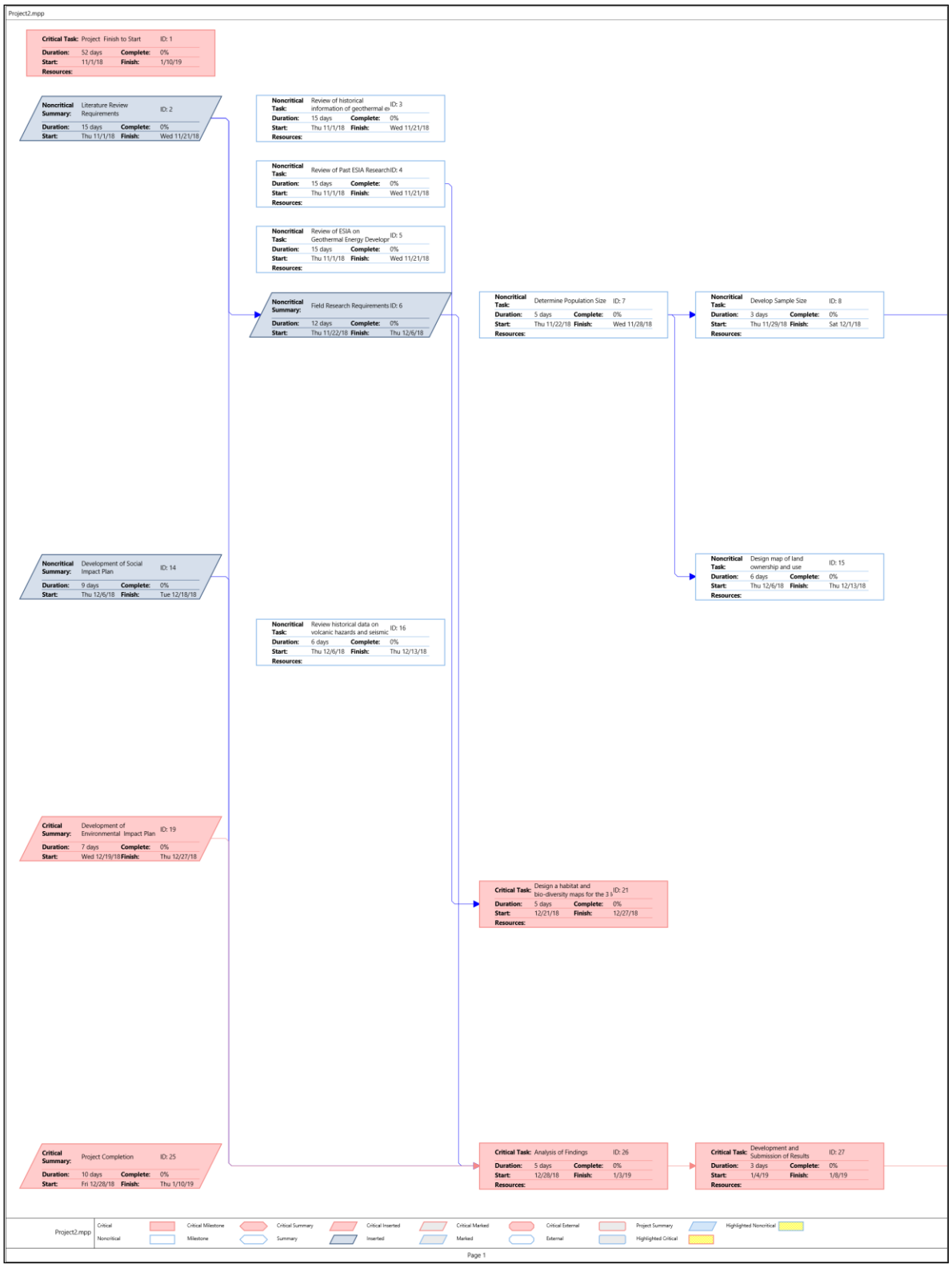


Figure 7 Sequence Activities Network Diagram (part 1)

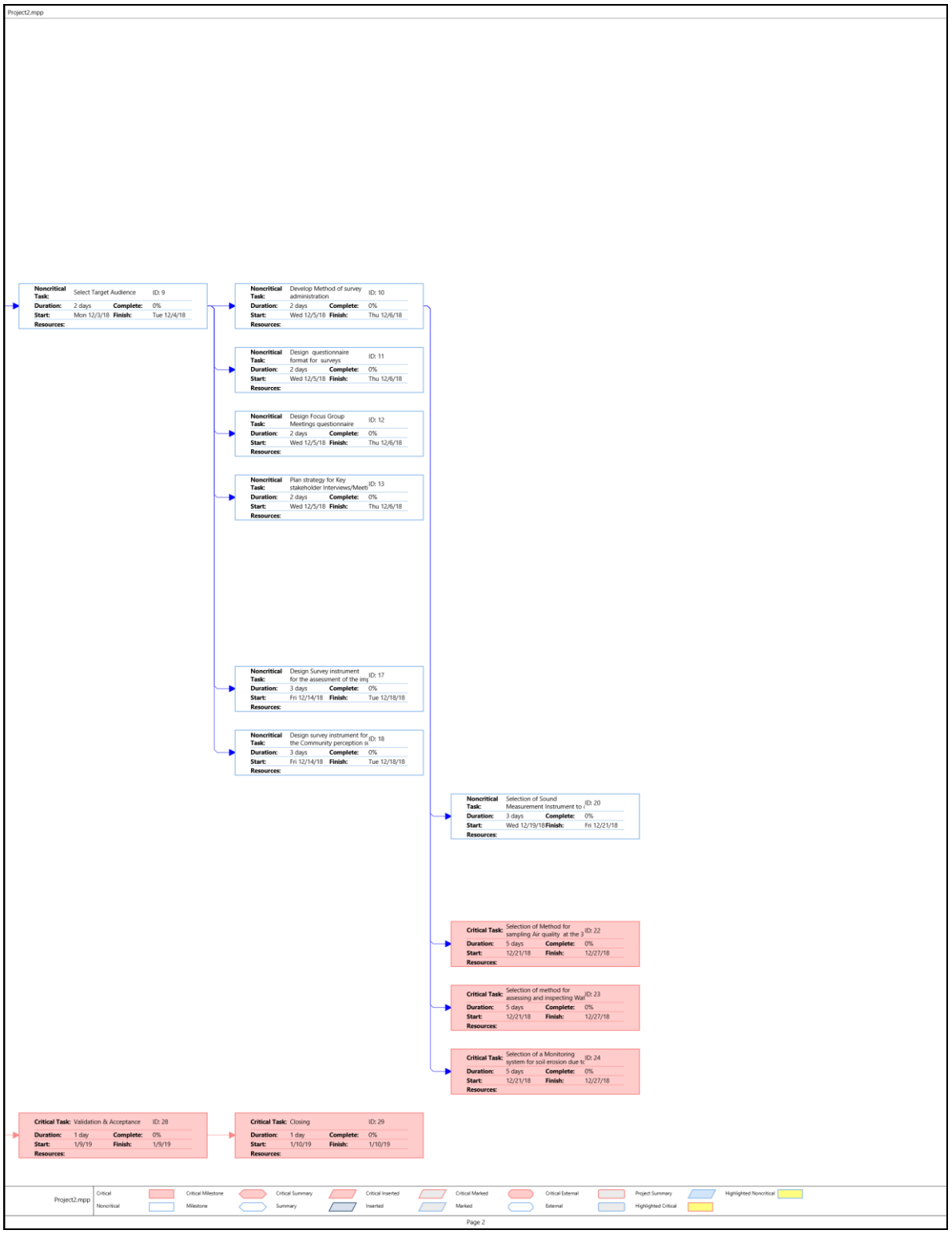


Figure 7 – Sequence Activities Network Diagram (part 2)

4.2.2.3 ESTIMATE ACTIVITY DURATION

The Project Manager goes through a process of estimating the number of work periods needed to complete individual activities and provides the amount of time each activity will take to complete. This is a major input in developing the schedule as the soundness of the schedule heavily depends on the accuracy of the duration of all project activities. Analogous Estimating based on analogies from the earlier similar projects (used in the network diagram above) and Expert Judgment are being used to find the approximate time duration. Incorporating these techniques as well as reserve analysis techniques provides an avenue for the Project Team to make any needed changes to the project. Below (Chart 7) illustrates a breakdown of work activities and their duration. The method of estimating is based on the following:

- 1 working day < / = 8 working hours
- 1 week = 5 days (Monday to Friday
- 1 month = 4 weeks = 20 days

Chart 7 **Estimate Activity Duration (Source – C. Fontenelle; author of study)**

ID#	ACTIVITY	DURATION IN DAYS
	Project Finish to Start	52 days
2.1	Literature Review Requirements	15 days
2.1.1	Review of historical information of geothermal exploration in St Lucia	15 days
2.1.2	Review of Past ESIA Research	15 days
2.1.3	Review of ESIA on Geothermal Energy Development in Guadeloupe	15 days
2.2	Field Research Requirements	12 days
2.2.1	Determine Population Size	5 days
2.2.2	Develop Sample Size	3 days
2.2.3	Select Target Audience	2 days
2.2.4	Develop Method of survey administration	2 days
2.2.5	Design questionnaire format for surveys	2 days
2.2.6	Design Focus Group Meetings questionnaire	2 days
2.2.7	Plan strategy for Key stakeholder Interviews/Meetings	2 days
3.1	Development of Social Impact Plan	9 days
3.1.1	Design map of land ownership and use	6 days
3.1.2	Review historical data on volcanic hazards and seismic activities	6 days
3.1.3	Design Survey instrument for the assessment of the impact of short term disruptions to farmers and community members	3 days
3.1.4	Design survey instrument for the Community perception survey	3 days
3.2	Development of Environmental Impact Plan	7 days
3.2.2	Selection of Sound Measurement Instrument to conduct Noise monitoring survey at the 3 locations	3 days
3.2.3	Design a habitat and bio-diversity maps for the 3 locations	5 days
3.2.4	Selection of Method for sampling Air quality at the 3 locations	5 days
3.2.5	Selection of method for assessing and inspecting Water quality at the 3 locations	5 days
3.2.6	Selection of a Monitoring system for soil erosion due to site drilling at the 3 locations	5 days
4	Project Completion	10 days
4.1	Analysis of Findings	5 days
4.2	Development and Submission of Results	3 days
4.3	Validation & Acceptance	1 day
4.4	Closing	1 day

4.2.3 DEVELOP SCHEDULE

Chart 8 Schedule for the Project Management Plan (Source – C. Fontenelle; author of study)

ID	ACTIVITY	DURATION IN DAYS	START	FINISH
	Project Finish to Start	52 days	Thu 11/1/18	Thu 1/10/19
2.1	Literature Review Requirements	15 days	Thu 11/1/18	Wed 11/21/18
2.1.1	Review of historical information of geothermal exploration in St Lucia	15 days	Thu 11/1/18	Wed 11/21/18
2.1.2	Review of Past ESIA Research	15 days	Thu 11/1/18	Wed 11/21/18
2.1.3	Review of ESIA on Geothermal Energy Development in Guadeloupe	15 days	Thu 11/1/18	Wed 11/21/18
2.2	Field Research Requirements	12 days	Thu 11/22/18	Thu 12/6/18
2.2.1	Determine Population Size	5 days	Thu 11/22/18	Wed 11/28/18
2.2.2	Develop Sample Size	3 days	Thu 11/29/18	Sat 12/1/18
2.2.3	Select Target Audience	2 days	Mon 12/3/18	Tue 12/4/18
2.2.4	Develop Method of survey administration	2 days	Wed 12/5/18	Thu 12/6/18
2.2.5	Design questionnaire format for surveys	2 days	Wed 12/5/18	Thu 12/6/18
2.2.6	Design Focus Group Meetings questionnaire	2 days	Wed 12/5/18	Thu 12/6/18
2.2.7	Plan strategy for Key stakeholder Interviews/Meetings	2 days	Wed 12/5/18	Thu 12/6/18
3.1	Development of Social Impact Plan	9 days	Thu 12/6/18	Tue 12/18/18
3.1.1	Design map of land ownership and use	6 days	Thu 12/6/18	Thu 12/13/18
3.1.2	Review historical data on volcanic hazards and seismic activities	6 days	Thu 12/6/18	Thu 12/13/18
3.1.3	Design Survey instrument for the assessment of the impact of short term disruptions to farmers and community members	3 days	Fri 12/14/18	Tue 12/18/18
3.1.4	Design survey instrument for the Community perception survey	3 days	Fri 12/14/18	Tue 12/18/18
3.2	Development of Environmental Impact Plan	7 days	Wed 12/19/18	Thu 12/27/18
3.2.1	Selection of Sound Measurement Instrument to conduct Noise monitoring survey at the 3 locations	3 days	Wed 12/19/18	Fri 12/21/18
3.2.2	Design a habitat and bio-diversity maps for the 3 locations	5 days	Fri 12/21/18	Thu 12/27/18

3.2.3	Selection of Method for sampling Air quality at the 3 locations	5 days	Fri 12/21/18	Thu 12/27/18
3.2.4	Selection of method for assessing and inspecting Water quality at the 3 locations	5 days	Fri 12/21/18	Thu 12/27/18
3.2.5	Selection of a Monitoring system for soil erosion due to site drilling at the 3 locations	5 days	Fri 12/21/18	Thu 12/27/18
4	Project Completion	10 days	Fri 12/28/18	Thu 1/10/19
4.1	Analysis of Findings	5 days	Fri 12/28/18	Thu 1/3/19
4.2	Development and Submission of Results	3 days	Fri 1/4/19	Tue 1/8/19
4.3	Validation & Acceptance	1 day	Wed 1/9/19	Wed 1/9/19
4.4	Closing	1 day	Thu 1/10/19	Thu 1/10/19

The preceding schedule management processes are incorporated to reflect the development of the Project Management Plan Schedule depicted in Chart 8 above. The approval of the sequenced activity list and estimate activity duration with an assessment of the schedule constraints will commission the start of the Schedule Development Process. The creation of a Schedule Model with the planned dates for completing the project activities throughout the project life cycle is relevant to meet the required project deliverables. The Project Sponsor will participate in reviews of the proposed schedule, validate and approve the final schedule before it is baselined. The schedule for the Project Management Plan will allow the Project Manager/Project Scheduler the ability to make changes by applying Schedule Compression Techniques. These techniques are applicable for changes in deliverable dates or schedule delays. However, it should be done without altering the scope of the project.

4.2.4 CONTROL SCHEDULE

To control the schedule, the Project Manager will utilize the Earn Value Analysis Technique to measure the amount of work actually performed on the project beyond the basic review of cost and schedule reports. The Schedule Performance Index (SPI) will be used to measure the schedule efficiency on the project. Upon review, if the SPI is less than 1 (meaning that the project is behind schedule) the Project Manager will control the schedule by analyzing performance variances, assessing final costs, controlling changes to the integrated baseline and developing corrective actions to get the project back on schedule.

4.3. COST MANAGEMENT PLAN

4.3.1 INTRODUCTION

The aim of the Cost Management Plan is to provide the planning and structure necessary to manage and control the costs of the project, and to keep costs within the limits of the budget. It is imperative that the Project Manager and Project Finance Manager estimate the cost of each activity, and each deliverable to guide in constructing the overall project budget. This will allow the effective allocation of costs for completing all project activities within the determined project budget. Subsequently, the cost will be baselined to reflect the initial cost of the project; and any changes to cost of activities will be made through a formal Change Request authorized by the Sponsor. The realization of the budget will be determined upon the team having zero change requests.

4.3.2 COST MANAGEMENT APPROACH

The Project Manager will be responsible for managing and reporting on the project's cost throughout the project life cycle. Costs for this project will be calculated from the bottom up (work packages) to the highest level (project level) in the WBS (see Figure 5 above) using the following processes:

- Plan Cost Management is the process of determining how the project cost will be estimated, budgeted, managed, monitored and controlled by using techniques such as Expert Judgment (to assist with cost estimating and budgeting) and Meetings between Project Manager and Finance Manager to develop the Cost Management Plan.
- Estimate Costs using Bottom Up Estimating (to develop estimates at the task level in WBS) and Data Analysis to include Reserve Analysis to account for cost uncertainties.
- Determine Budget using Cost Aggregation for summing the costs for each work package to the control account up to the project level.

- Control Costs using Earn Value Analysis to compare the performance measurement baseline to the actual cost performance and Variance Analysis to determine the cause of any variance.

4.3.2 COST MANAGEMENT PROCESSES

4.3.2.1 ESTIMATE COSTS

The breakdown of activities in the WBS and Expert Judgement based on the Project Manager's and Project Finance Manager's experiences are used to provide guidance in calculation of the cost estimates and resources required to realize project deliverables. A cost estimate has been prepared to provide an estimate of the budget needed to realize the project scope as reflected in Figure 8 below. Costs for this project are calculated from the work package level in the WBS and Control Accounts are created at this level to track costs.

Project Name	Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia	**Date**	November 01, 2018
Project Number	1	**Document Number**	1
Project Manager	Cynthia Fontenelle	**Project Sponsor**	Michael Pistone

WBS ID	Activity Name	Unit Costs in XCD	Resources
2	**PROJECT COLLECT REQUIREMENTS**		
2.1	**Literature Review**		
2.1.1	Review of Historical Information of Geothermal Exploration in St Lucia	5000.00	Project Team
2.1.2	Review of Past ESIA Research	2000.00	Project Team

2.1.3	Review of ESIA on Geothermal Energy Development in Guadeloupe	3700.00	Project Manager Project Team
2.2	**Field Research**		
2.2.1	Determine Population Size	1500.00 x 3 locations =4500.00	Project Manager Project Team
2.2.2	Develop Sample Size	1200.00	Project Manager Project Team
2.2.3	Select Target Audience	450.00	Project Manager Project Team
2.2.4	Develop Method of survey administration	450.00	Questionnaire Designer
2.2.5	Design questionnaire for surveys	450.00	Questionnaire Designer
2.2.6	Design Focus Group Meetings questionnaire	450.00	Questionnaire Designer
2.2.7	Plan strategy for Key stakeholder Interviews/Meetings	1500.00	Project Manager Project Team
3	**PROJECT REQUIREMENTS PLAN**		
3.1	**Social Impact Plan**		
3.1.1	Design map of land ownership and use	500.00 x 3 locations =1500.00	Project Technical Team
3.1.2	Review historical data on volcanic hazards and seismic activities	1800.00	Project Team
3.1.3	Design Survey Instrument for the assessment of the impact of short term disruptions to farmers and community members	475.00	Questionnaire Designer
3.1.4	Design Survey Instrument for the Community Perception Survey	450.00	Questionnaire Designer
3.2	**Environmental Impact Plan**		
3.2.1	Design a Habitat and Bio-	500.00 x 3	Project

	diversity map for the 3 locations	locations = 1500.00	Technical Team
3.2.2	Selection of Sound Measurement Instrument to conduct Noise Monitoring Survey at the 3 locations	500.00 x 3 locations = 1500.00	Project Technical Team
3.2.3	Selection of Method for sampling Air Quality at the 3 locations	500.00 x 3 locations = 1500.00	Project Technical Team
3.2.4	Selection of method for assessing and inspecting Water Quality at the 3 locations	500.00 x 3 locations = 1500.00	Project Technical Team
3.2.5	Selection of a Monitoring System for soil erosion due to site drilling at the 3 locations	500.00 x 3 locations = 1500.00	Project Technical Team
4	**PROJECT COMPLETION**		
4.1	Analysis of Findings	15 00.00	Project Manager Project Team
4.2	Development and Submission of Results	15 00.00	Project Manager
4.3	Validation & Acceptance	0.00	
4.4	Closing – Update Files	500.00	Project Manager

Figure 8 Estimate costs of Activities

4.3.2.2 DETERMINE BUDGET

The budget in Chart 9 is calculated based on aggregating the estimated costs of individual activities in Figure 8 above to establish an authorized cost baseline against which the project will be monitored and controlled. This process will be carried out on a monthly basis. A contingency reserve of 15% has been added for the estimated cost of “known-unknowns” risks (risks identified through a creative risk process and expert judgement) that can affect the project cost, budget and schedule. The contingency reserve is the estimated cost of risks that probably would occur. Based on the Project Manager’s past experiences with risks on similar projects, a 15% contingency was applied to cover the known-unknown risks. Additionally, a management reserve of XCD 5000.00 has been applied for unknown-unknown risks. These risks are genuine emergent risks outside of the project team’s cognizance which could not be predicted through the risk identification process.

The budget is estimated at XCD 38 438.75 inclusive of a contingency reserve of XCD 5013.75 and a management reserve of XCD 5000.00.

Chart 9 Budget (Source – C. Fontenelle; author of study)

ACTIVITY LIST	COST in XCD	CONTINGENCY RESERVE @15% in XCD	CONTROL ACCOUNT
Review of historical information of geothermal exploration in St Lucia	5000	750	5750
Review of Past ESIA Research	2000	300	2300
Review of ESIA on Geothermal Energy Development in Guadeloupe	3700	555	4255
Determine Population Size	4500	675	5175
Develop Sample Size	1200	180	1380
Select Target Audience	450	67.5	517.5
Develop Method of survey administration	450	67.5	517.5
Design questionnaire for surveys	450	67.5	517.5
Design Focus Group Meetings questionnaire	450	67.5	517.5
Plan strategy for Key stakeholder Interviews/Meetings	1500	225	1725
Design map of land ownership and use	1500	225	1725
Review historical data on volcanic hazards and seismic activities	1800	270	2070
Design Survey instrument for the assessment of the impact of short term disruptions to farmers and community members	475	71.25	546.25
Design survey instrument for the Community perception survey	450	67.5	517.5
Design a habitat and bio-diversity map of the 3 locations	1500	225	1725
Selection of Sound Measurement Instrument to conduct Noise monitoring survey at the 3 locations	1500	225	1725
Selection of Method for sampling Air quality at the 3 locations	1500	225	1725
Selection of method for assessing and inspecting Water quality at the 3 locations	1500	225	1725
Selection of a Monitoring system for soil erosion due to site drilling at the 3 locations	1500	225	1725
Development and Submission of Results	1500	225	1725
Validation & Acceptance	0	0	0
Closing – Update Files	500	75	575
Management Reserve			5000
AGGREGATE	**33425**	**5013.75**	**38438.75**

4.3.2.3 CONTROL COSTS

The Project Manager will monitor the status of the project to update the project costs and manage changes to the cost baseline. Any changes to cost baseline will be done through the Change Control Process. During monthly project status meetings, the Project Manager will meet with the Project Team and Project Sponsor to present and review the project's cost performance for the previous month. Performance will be measured using Earned Value Analysis to compare the performance measurement baseline to the actual cost performance; and Variance Analysis to determine the cause of any variances. Cost variances of +/- 0.1 in the cost and schedule performance indexes will change the status of the cost to cautionary. As such, those values will be changed to yellow. Cost variances of +/- 0.2 will change the status of the cost to an alert stage and as such, those values will be changed to red in the project performance reports. Costs will be rounded to the nearest dollar and work hours rounded to the nearest whole hour. In the event of any deviations, the Project Manager will take corrective actions through a Project Change Request which must be approved by the Project Sponsor.

4.4. COMMUNICATIONS MANAGEMENT PLAN

4.4.1 INTRODUCTION

To create the Communication Plan, it is necessary that the Project Manager ensures that the communication needs of all stakeholders are met through development and implementation of activities designed to achieve effective information exchange. The Project Manager will take a proactive role in ensuring effective communication on this project and that communications requirements are documented in the Communications Requirements Matrix presented in Appendix 10. The Communications Requirements Matrix will be used as a guide to the Project Team in communicating with internal stakeholders. The Project Manager is responsible for managing all proposed and approved changes to the Communications Management Plan. Once the change is approved, the Project Manager will update the plan and present changes and supporting documentation to the Project Sponsor. The Project Manager is also responsible for ensuring that communication activities are performed by the Project Team within the approved budget, schedule, and resource allocations.

4.4.2 COMMUNICATIONS MANAGEMENT APPROACH

The Communications Management Approach provides guidance on the following processes to collect information from and disseminate to stakeholders:

- Plan Communications Management to develop an appropriate approach and plan for the project communication activities based on the information needs of each stakeholder or group, project needs and resources using Expert Judgement (sourcing knowledge and expertise from consultants and other stakeholders working on similar projects); Communications Requirement Analysis (stakeholder information and communications requirements within the stakeholder register and stakeholder engagement strategy); Communications Technology (to transfer information among stakeholders as indicated in the Communications Matrix and stakeholder engagement

strategy); and Meetings with Project Team to update Communications Project Report.

- Manage Communications by developing various Communications Methods to allow flexibility in communicating to stakeholders; utilizing Project Reporting to provide information at an appropriate level, format and detail for each type of stakeholder; and Meetings to refine actions in the Communications Strategy/Plan.
- Monitor Communications using Data Representation by reviewing changes between desired and current engagements and adjusting communications as necessary.

4.4.3 COMMUNICATIONS MANAGEMENT PROCESSES

4.4.3.1 PLAN COMMUNICATIONS MANAGEMENT

The plan sets the framework for the communication needs throughout the project life cycle. In developing an appropriate approach and plan for the project communication activities, the Project Manager and team members will develop (1) a Communications Requirement Matrix (depicted in Appendix 10) to map the communications requirement for the project which will be updated as the communications needs change throughout the project life cycle. Interactive communication will be used to allow effective two-way dialogue to prevent misinterpretation and facilitate timely feedback among Project Team; (2) a Stakeholder Engagement Strategy (illustrated in Appendix 11) to effectively communicate with stakeholders through the use of Push Communication (to allow project team to control and determine who receives the communication, how they receive it, and when) and Interactive Communication through focus group discussions, meetings and interviews; and (3) Stakeholder Register Matrix (see Chart 10 below) to identify persons and organizations that may be affected or impacted or have any interest in the project's weekly project team meetings.

Chart 10 Stakeholder Register Matrix (Source – C. Fontenelle; author of study)

ID#	Stakeholders	Stakeholder Classification	Main Expectations	Major Requirements
1	Government – Sponsor	Internal	The ESIA reflects positive environmental impact and to make an informed decision on Geothermal Exploration and Development in St. Lucia to reduce reliance on fossil fuels for energy generation.	Successful completion of the ESIA with the highest quality of results. The provision of energy services in a sustainable manner, to be provided for all people in ways that, now and in the future, are sufficient to provide basic necessities, affordable, not detrimental to the environment, and acceptable to communities and people.
2	Environmentalists - Environmental Agencies	External	To campaign for the least negative impact on the environment.	To gain the trust of major players to influence environmentally favorable decisions.
3	Professional Conservators - Conservation & Heritage Organizations	External	The preservation of artifacts that symbolize cultural values such as Amerindian terraces, sacred graves, rocks, lakes, waterfalls and other forms of non-tangible cultural heritage.	Monitoring and controlling the environment in which artifacts are stored to prevent deterioration or damages during exploration.
4	Land Owners in the proposed areas of Choiseul/Soufriere and Laborie	External	The preservation of lands, especially agricultural lands, for farming to maintain livelihood.	Minimum destruction to farmers and positive impact on livelihood.
5	Community Members in the proposed areas of	External	To gain knowledge and understanding about geothermal energy.	To provide community members the opportunity and medium to voice their opinions, hopes, and

	Choiseul/Soufriere and Laborie		The views and concerns of community members are dealt with in a timely and professional manner.	fears about the project.
6	Residents close to the proposed areas of Choiseul/Soufriere and Laborie	External	To gain knowledge and understanding about geothermal energy.	To provide residents the opportunity and medium to voice their opinions, hopes, and fears about the project.
7	Hotel & Tourism Sector	External	The development of geothermal energy will contribute to a stable and lower electricity rate.	To engage the Hotel and Tourism Sector to mitigate any disruptions to touristic sites and hotels in the nearby communities.
8	The St Lucia Electricity Services Ltd	External	To make an informed decision regarding geothermal energy development as a sustainable energy option for the country. To access a cheaper and cleaner method of providing electricity.	The provision of energy services in a sustainable manner.
9	World Bank	External	The development of geothermal energy will contribute to fiscal sustainability by providing more stable and lower electricity rates; reduce fossil fuel imports which increases economic and climate resilience through lower risk of supply disruptions due to extreme weather events such as hurricanes.	To support the Government of Saint Lucia to assess the viability of harnessing geothermal energy.

4.4.3.2 MANAGE COMMUNICATIONS

The Project Manager and his team will go through a process of creating, collecting, distributing, storing and retrieving information from project documents such as the Risk Register, Issue Log, Schedule Activity List, Milestone List, Communications Requirement Matrix and Stakeholder Engagement Plan for the efficient and effective communications flow among project stakeholders. Managing communications is a critical success factor for managing stakeholders' expectations, hence the Project Manager will ensure that there is effectiveness in frequency and quality of information, and stakeholder engagement through open two-way communication for real time updates and feedback. Additionally, the project communications status will be reported from the Project Team to the Project Manager, and from the Project Manager to the Sponsor and stakeholders. The project's schedule, cost and scope constraints will be considered in managing all means of communication and discussed during meetings with the Project Team.

4.4.3.3 MONITOR COMMUNICATIONS

It is imperative that the Project Manager develops a Communications Monitoring System to establish that the communications methods are achieving the intended project results. Hence, the Project Management Information System (PMIS) software will be utilized for communicating tasks and document sharing for internal stakeholders, as well as offer key external stakeholders the ability to log in and provide feedback on relevant project documents. It will also monitor the different phases to provide insights on whether or not the project is on schedule and budget. Additionally, as a means of monitoring communications, the Project Manager will control the flow of communication and the information shared in order to communicate the appropriate information to stakeholders and to ensure that the information needs of both the project and stakeholders are being realized.

4.5. STAKEHOLDERS MANAGEMENT PLAN

4.5.1 INTRODUCTION

The success of the project is heavily dependent on its stakeholders (people, groups and organizations that could affect or be affected by the project). It is important for the Project Manager to analyze stakeholder expectations and their impact on the project; develop appropriate strategies and tactics for effectively engaging stakeholders in a manner appropriate to the stakeholders' interest and involvement in the project; and actively manage stakeholder expectations to successfully meet the project objectives and deliverables.

4.5.2 STAKEHOLDERS MANAGEMENT APPROACH

The Stakeholder Management Approach provides guidance on the following processes that are needed to systematically identify, analyze, plan and implement actions to adequately engage stakeholders:

- Identify Stakeholders involves identifying project stakeholders and documenting relevant information regarding their interests, involvement, influence and potential impact on the project using techniques such as Data Gathering from interviews, focus groups, questionnaires; Data Analysis through creation of a Stakeholder Analysis; and Data Representation through the use of Stakeholder Mapping Representation.
- Plan Stakeholder Engagement by developing approaches to involve the identified stakeholders based on their needs, expectations, interests and potential impact on the project through the use of a Stakeholder Prioritization Matrix.
- Manage Stakeholder Engagement by communicating and working with the stakeholders to meet their needs, expectations, address issues and foster greater stakeholder involvement through feedback on meetings, conversations, and issue identification and discussions.

- Monitor Stakeholder Engagement by monitoring stakeholders' relationships and tailoring strategies for engaging stakeholders through modifications to the Stakeholder Engagement Strategy in Appendix 11, based on information derived from Meetings and Consultations.

4.5.3 STAKEHOLDER MANAGEMENT PROCESSES

4.5.3.1 IDENTIFY STAKEHOLDERS

Stakeholder identification is an iterative process which must be monitored throughout the project life cycle. Project stakeholders have been identified in the Stakeholder Register on pg. 59 (Chart 10). To confirm that the stakeholder identification and analysis process is accurate and complete, the Project Manager will facilitate a succession of reviews with the Project Team and Sponsor. However, as the project moves forward, the Project Manager may introduce new stakeholders to the project. This must be updated in the same register. Stakeholders are mapped out and classified based on their power and interests as seen in Figure 9 below and will be monitored and updated (if necessary) throughout the project life cycle. This will ensure that the Project Team meets the needs of each group of stakeholders.

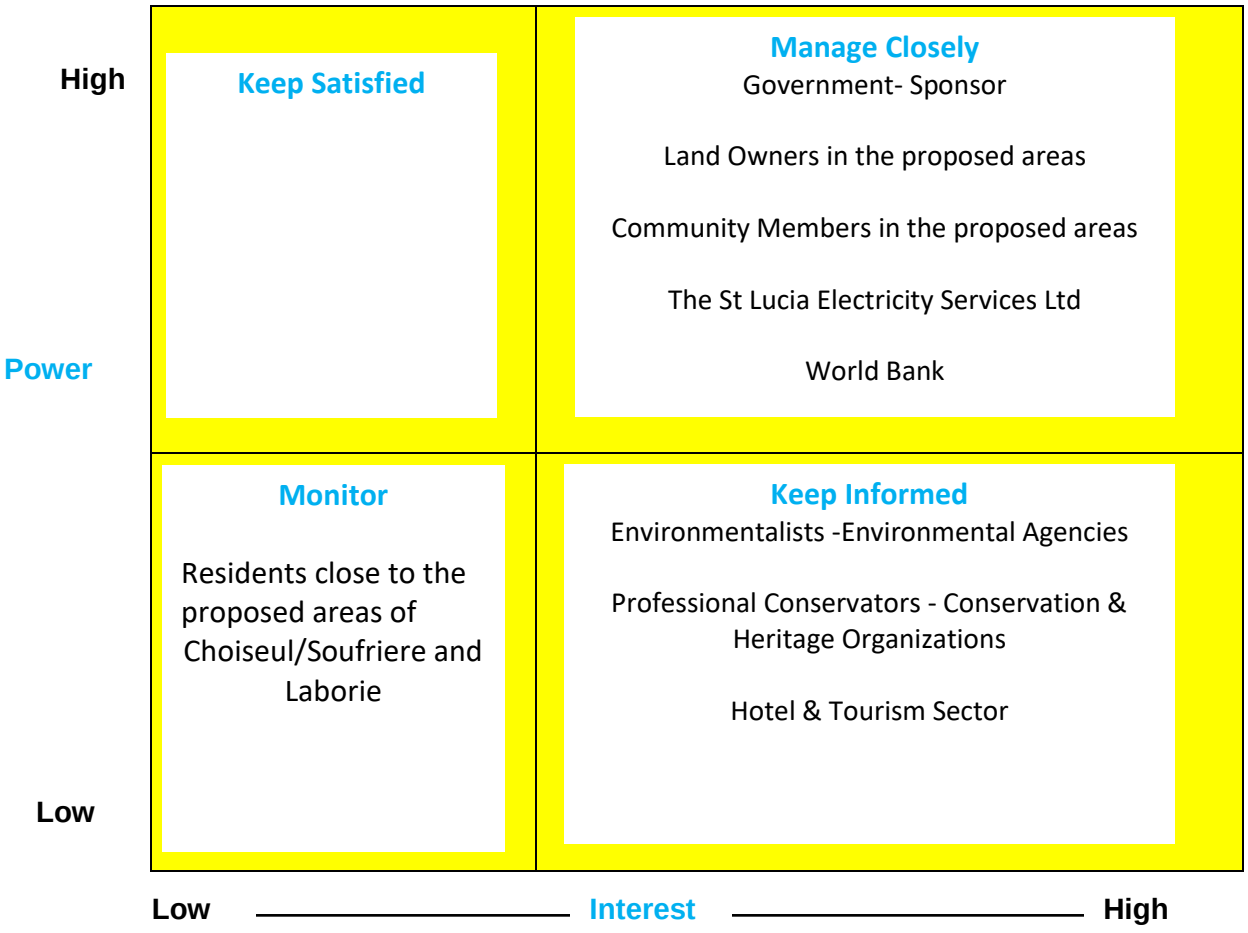


Figure 9 Power/Interest Grid for Stakeholder Prioritization

4.5.3.2 PLAN STAKEHOLDER ENGAGEMENT

The Stakeholder Engagement Process will be free of manipulation and intimidation and ongoing throughout the life cycle of the project, with continuous managing and monitoring of stakeholders' engagements. The Project Manager will ensure that stakeholder engagement is initiated at an early stage of the project life cycle and supports the development of strong, constructive and responsive relationships with stakeholders that are important for successful implementation of the Environmental and Social Impact Assessment Plan. The engagement process will include scheduled and prioritized meetings, interviews, workshops, surveys as indicated in the Stakeholder Engagement Technique (Chart 11) below which will be used alongside the Stakeholder Engagement Strategy in Appendix 11 to disseminate

information, keep stakeholders abreast of project developments and for information sharing relevant to the particular group based on the needs and expectations of stakeholders. The Project Manager will also implement outreach programs to provide ongoing and timely information to the affected communities of Soufriere, Laborie and Choiseul and to encourage equal participation of all affected groups (identified in Figure 8 Power/Interest grid) in the consultation process. Consultations will be carried out on an ongoing basis as the nature of issues, impacts, and opportunities evolves and frequency of these interactions may vary depending on the phase of the project. Additionally, an Issue Log will be created to address grievances during implementation of the project.

Chart 11 Plan Stakeholder Engagement Technique (Source Engagement Technique[*1] modified by C. Fontenelle; author of study)

ENGAGEMENT TECHNIQUE	APPLICATION OF TECHNIQUE
Correspondence by phone/email/text	• Distribute project information to Government Officials, Environmental and Conservation Agencies, Hotel and Tourism Sector • Invite stakeholders to meetings
Print media and radio announcements	• Disseminate project information to the 3 affected communities and communities close to affected areas • Inform stakeholders about consultation meetings
One-on-one interviews	• Solicit views and opinions of stakeholders • Enable stakeholders to speak freely and confidentially about the controversial geothermal energy development • Build personal relations with stakeholders • Recording of interviews
Public Outreach	• Present project information to a large audience of stakeholders, and in particular the 3 communities • Allow the community members to provide their views and opinions • Build relationships with neighboring communities • Distribute non-technical project information • Facilitate meetings using PowerPoint presentations, videos and project information documents • Record discussions, comments/questions raised and responses
Workshops	• Present project information to a group of stakeholders

	• Allow the group of stakeholders to provide their views and opinions • Use participatory exercises to facilitate group discussions • Recording of responses
Focus group meetings	• Allow a smaller group of between 10 and 15 people to provide their views and opinions of targeted baseline information • Use a focus group interview guideline to facilitate discussions • Record responses
Surveys	• Gather opinions and views from individual stakeholders • Gather baseline data • Record data • Develop a baseline database for monitoring impacts

4.5.3.3 MANAGE STAKEHOLDER ENGAGEMENT

Managing stakeholders' engagement requires that the Project Manager and his team firstly manage stakeholder expectations by effectively communicating with them for the purpose of meeting their needs, providing them with an opportunity to raise their concerns and opinions, and address issues on the environmental and social impact assessment while continuously negotiating and influencing the desires of the stakeholders to realize project objectives. Secondly, the Project Manager and the team manage stakeholder perception by ensuring that stakeholders are engaged with the project on a scheduled basis and they are aware of current status of the project work as high-level stakeholder perception increases the necessary support level to implement the project as expected. Thirdly, the Project Team records and logs all the stakeholders' activities and feedback and updates the Communication Plan and Stakeholder Engagement Strategy as needed. Finally, the Project Manger conducts effective conflict management by addressing stakeholders' concerns to prevent or mitigate issues and conflicts in order to secure stakeholder acceptance, and the project Communications Plan adherence.

4.5.3.3 MONITOR STAKEHOLDER ENGAGEMENT

To monitor stakeholder engagement, the Project Manager will compare the Stakeholder Management Plan against actual stakeholder engagement to investigate variances. In the event the stakeholder engagement is not having the planned effect, the Project Team will make changes to the Power/Interest Grid in Figure 9 above if their interests and power have shifted; and review the Stakeholder Engagement Strategy in Appendix 11 to continue to meet needs and expectations of stakeholders.

It is important that the Project Manager monitors stakeholders' relationships to maintain and increase the efficiency and effectiveness of stakeholder engagement activities as the project evolves. However, for this process to be effective, it requires active listening by team members (to reduce misunderstandings and other miscommunication); and strong leadership skills by the Project Manager (to communicate the vision and inspire stakeholders to support the work and outcomes of the project).

4.6. RISK MANAGEMENT PLAN

4.6.1 INTRODUCTION

A Risk is an event or condition that, if it occurs, could have a positive or negative effect on a project's objectives. The Risk Management Plan defines how risks associated with the Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia will be identified, analyzed, and managed. The Project Manager and his team will continuously assess risks, determine and prioritize what risks can be minimized or eliminated; and develop and implement responses to mitigate identified risks. A contingency reserve of 15% and management reserve of XCD 5000.00 has been added to the budget (as explained in the Determine Budget section on pages 58-59) to cover known-unknown risks and unknown- unknown risks.

The Project Manager and team will meet during the planning phase to identify project risks and risk response strategies. Thereafter risks will be analyzed and documented using the Risk Register in Appendix 12. During the execution and control phase, at regularly scheduled status meetings, the Project Manager and team members will review the status of identified risks and determine whether additional risk factors have surfaced. Any new risks (unknown risks) identified will be documented in the Risk Register, analyzed and planned for in the same manner as the known risks identified during the planning phase.

4.6.2 RISKS MANAGEMENT APPROACH

This approach documents the processes, tools and procedures that will be used to manage and control those events that could have a negative or positive impact on the project. It is the controlling document for managing and controlling all of the project risks and will address the following processes:

- Plan Risk Management which is the process of defining how to conduct risk management activities for the project using Expert Judgement from

conducting similar risks exercises on other projects, and Meetings with team to identify potential risks at every stage of the project.

- Identify Risks which is the process of identifying individual project risks, as well as sources of overall projects risks and documenting characteristics through meetings, brainstorming, and document analysis.
- Perform Qualitative Risks by prioritizing individual risks for further analysis or actions by assessing the probability of occurrence and impact, using risk categorization.
- Plan Risks Responses by developing option, selecting strategies, and agreeing on options to address overall risks exposure and to treat individual risks.
- Implement Risks Response strategies which is the process of executing agreed risk response strategies.
- Monitor Risks which includes monitoring the implemented risks response strategies, tracking identified risks, identifying and analyzing new risks, and evaluating the effectiveness of the implemented risk strategies and processes.

4.6.3 RISKS MANAGEMENT PROCESSES

4.6.3.1 IDENTIFY RISKS

The Risk Management Process aims to identify and assess risks in order to enable the risks to be understood clearly and managed effectively. As a result, the Project Manager will create a Risk Breakdown structure (illustrated in Chart 12 below) to aid with the understanding and identification of the risks involved in this project. Subsequently, the Project Manager and his team will create a Risk Register (exemplified in Appendix 12) to identify known risks likely to affect the project, and document the characteristics of each of these risks. Other risks identified during the project life cycle will also be included in the risks register; some risks will be inherent to the project itself, while others will be the result of external influences.

Chart 12 **Risk Breakdown Structure (Source - C. Fontenelle; author of study)**

Risk Breakdown Structure			
RBS LEVEL 0	**RBS LEVEL 1**	**RBS LEVEL 2**	**RBS LEVEL 3**
0.Project Risks	1.External	Environment	3.1 Weather conditions 3.2 Protection of Biodiversity
	2.Stakeholders	Research	3.3 Challenges to gain access to literature review within the stipulated time frame 3.4 Lack of willingness of community members to participate in qualitative and quantitative research
		Funding	3.5 Inadequate project funding/Untimely release of funds
	3.Project	Engagement	3.6 Inadequate Stakeholder Engagement
		Team	3.7 Poor communications and interpersonal skills 3.8 Poor schedule management 3.9 Poor cost management 3.10 Changes to core team

The Project Team will be coached on the need for risk awareness to allow for an understanding of what constitutes a risk; being sensitive to specific events or factors that could potentially impact the project in a positive or negative way; and communicating these risk factors or events to the Project Manager. In identifying risks, the Project Manager will give special attention to project deliverables, assumptions, constraints, WBS, budget and schedule.

4.6.3.2 PERFORM QUALITATIVE RISKS

Based on the above categorization and identification of risks, the Project Manager will perform a Qualitative Risk Analysis to prioritize risks for further analysis or action by assessing and combining their probability of occurrence and impact as demonstrated in Figure 10 below. This will assist the Project Manager to reduce the level of uncertainty and to focus on high-priority risks. Throughout the project life cycle, risk reviews will be conducted and new risks identified, analyzed and updated in the Probability and Impact Matrix in Figure 10 below, as well as in the Risk Register in Appendix 12.

		IMPACT			
		ACCEPTABLE LITTLE TO NO EFFECT ON EVENT Low	TOLERABLE EFFECTS ARE FELT, BUT NOT CRITICAL TO OUTCOME Medium	UNDESIRABLE SERIOUS IMPACT TO THE COURSE OF ACTION AND OUTCOME High	INTOLERABLE COULD RESULT IN PROJECT FAILURE Very High
PROBABILITY	IMPROBABLE - RISK IS UNLIKELY TO OCCUR 1	Changes to core team			
	POSSIBLE - RISK WILL LIKELY OCCUR 2	Challenges to gain access to literature review within the stipulated time frame	Biodiversity Habitat Disturbances Poor communications and interpersonal skills		Inadequate Stakeholder Engagement
	PROBABLE - RISK WILL OCCUR 3			Weather Conditions Lack of willingness of community members to participate in qualitative and quantitative research Poor cost management Unavailability of designated technical experts	Inadequate project funding/ Untimely release of funds

Figure 10 Qualitative Risks – Probability and Impact Matrix

4.6.3.3 PLAN AND IMPLEMENT RISKS RESPONSES

The Project Manager will provide a risk response to each identified risk in the Risk Register. The probability of the risk event occurring and the impacts will be the basis for determining the degree to which the actions to alleviate the risk will be taken. Risk response strategies for the individual risk will be included in the Risk Register as illustrated in Appendix 12 and includes Escalation Strategy to be applied to any risk where the Project Manager does not have the autonomy or resources to manage; Mitigation Strategy will be employed to identify the various activities, or steps, to reduce the probability and/or impact of an adverse risk and creation of a contingency plan to deal with the risk should it occur; and Accept Strategy by not taking any actions to manage the risk except it being acknowledged. The Project Team will carefully develop strategies to manage risks such as weather conditions; lack of willingness of community members to participate in qualitative and quantitative research; unavailability of designated technical experts and cost management in the Orange Section of the Matrix above, and Inadequate Project Funding/ Untimely Release of Funds in the Red section to avoid project failure or issues with scope, schedule and budget.

A contingency reserve of 15% is reflected and described in the budget (on pages 58 to 59) to cover the known-unknown risks that can affect the schedule, budget, and scope of the project. The Project Manager is authorized to spend the allocated contingency reserve on addressing risks as they occur to ensure that these risks do not compromise the project. In addition, a management reserve of XCD5000.00 has been added for any unknown-unknown risks to cover risks which are unidentified and difficult to anticipate, and which the project manager cannot implement in advance risk response strategies.

The project team will utilize strategies in the Risk Register in Appendix 12 to implement risk responses to known risks and to provide guidance on reducing the exposure to individual risks and minimize threats to the project deliverables.

4.6.3.4 MONITOR RISKS

Following the implementation of the risk response strategies, and throughout the project lifecycle, the Project Manager will conduct on-going risk response activities by tracking the identified and analyzed risks; formulating new response strategies where necessary; ensuring the proper execution of planned risk responses and evaluating the overall effectiveness of the Risk Management Plan. For risks that have been fully mitigated, the project team will record results in the Risks Register and close the risk. Conversely, the project team will reformulate the response strategies, and/or re-assign a capable team member to manage risks which are not fully mitigated.

Additionally, it is important that team members are assigned to the individual risks in the Risk Register, notify the Project Manager immediately of any new risks or uprising issues. This will enable the Project Manager to employ a timely and appropriate risk response strategy and assign resources if necessary. The Project Manager and the team are expected to review and update the Risk Register as needed, and notify the Project Sponsor through the project status report of any changes to risks status or any new risks which can have a great impact on schedule and cost.

5 CONCLUSIONS

The development of this Project Management Plan emphasizes the importance of carrying out an assessment of the Environmental and Social Impact of Geothermal Energy Development in St Lucia. It provides guidelines on the development of a systematic and holistic process that allows stakeholders to better understand the environmental impact of the proposed project and examine factors such as water quality, air quality, noise level, geology/soil, natural habitats and bio-diversity; and the social aspect which provides strategies for analyzing, monitoring and managing the intended and unintended social consequences. This process was carried out through the application of a number of PMBOK's project management knowledge areas, processes and techniques.

Firstly, a Scope Management Plan was developed to determine and document the project scope needed to successfully analyze literature review and conduct field research on the Environmental and Social Impact of Geothermal Energy Development in the Soufriere, Choiseul, and Laborie areas. This included defining the roles and responsibilities of project team members; development of a WBS for the decomposition of the work to be executed by the project team; a WBS Dictionary which highlighted the requisite resources and tasks required to achieve deliverables; and the utilization of various research instruments including meetings, interviews, focus groups discussions, gathering of technical information and questionnaires for technical data collection, as well as community feedback.

Secondly, a detailed Schedule Management Plan was developed for planning, documenting and prioritizing the required project work, and the selection of applicable tools and techniques for monitoring and controlling the schedule for the timely completion of deliverables. An activity list was developed to provide a detailed description of each activity needed to complete the project work and was subsequently sequenced with a finish-to-start relationship. Thereafter, the number of work periods needed to complete individual activities was estimated and a 52

days' schedule was developed in MS Project with planned dates for completing the project activities throughout the project life cycle. Mitigation measures were also developed for any schedule variances.

Thirdly, a Cost Management Plan was created to provide the planning and structure necessary to manage and control the costs of the project. This included estimating cost of activities in the Activity List; and the development of a budget to establish an authorized cost baseline against which the project will be monitored and controlled. Any deviations from the actual cost performance will be measured using the Earned Value Analysis Technique which will allow the Project Manager to take corrective actions in controlling the budget.

Fourthly, a high level Communications Plan was developed which defined the general communication requirements of the project and entailed the creation of a Communications Matrix which mapped the communications requirement for the project; a Stakeholder Register Matrix which identified persons and organizations that may directly or indirectly be affected, impacted or have any interest in the project, or its outcome; and a Stakeholder Engagement Strategy for managing stakeholders' expectations and engagements through open two-way communication for real time updates and feedbacks. Additionally, the Stakeholder Engagement Strategy and Stakeholder Register will be utilized to manage and monitor communications to establish that the communications methods are achieving the intended project results.

Fifthly, a Stakeholder Management Plan was developed to identify and categorize project stakeholders, analyze stakeholders' expectations and to develop appropriate strategies for stakeholder engagement. This process included the creation of a Power/Interest Grid to classify stakeholders in the Stakeholder Register; and the creation of a Stakeholder Engagement Technique to be used alongside the Stakeholder Engagement Strategy to disseminate information and to keep stakeholders abreast of project developments. The project team will be

expected to record and log all the stakeholders' activities and update the Communication Plan and Stakeholder Engagement Strategy as needed. The Project Manager will be responsible for effective conflict management by addressing stakeholders' concerns and developing means to mitigate conflicts.

Finally, a Risk Management Plan was designed to depict how the risks associated with the Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia will be identified, analyzed, and managed. This process included the creation of a Risk Breakdown Structure to aid with the understanding and identification of the risks involved in this project and a Risk Register to identify and document known risks likely to affect the project. A Qualitative Risk Analysis through the utilization of a Probability and Impact Matrix was developed to prioritize risks. Subsequently, Risk Response Strategies (Accept, Mitigation and Escalation Strategies) were created to reduce or eliminate any threats and increase the probability and impact of opportunities to the project. The Project Manager is expected to conduct on-going risk response activities and formulate new response strategies (when necessary) for the overall effectiveness of the Risk Management Plan.

6 RECOMMENDATIONS

The following recommendations will be made to the Renewable Energy Division:

- The Project Management Plan should be used as a source of information to provide the Project Team with the necessary tools and techniques to be able to manage the project execution using “best practices”.
- The Project Team should also be familiar with the templates provided in each plan in order to use them appropriately.
- Monthly meetings are highly recommended to keep track of the project charter, each of the subsidiary plans and the progress towards the completion of the project objectives.
- All data received should be analyzed in order to track progress accurately and control any emergent risk that might appear.
- The development of a Quality Policy to incorporate planning, managing and controlling quality requirements. This will ensure that the Air, Noise and Water Inspection Monitoring Systems meet international standards.
- Communications training for project team to aid in more effective dialogue and engagement with stakeholders.
- A Procurement Plan to acquire services of consultants for (1) communications training; (2) contract technical expertise with relevant equipment outside the Project Team for the technical survey (Noise, Air Water) as they will already have expertise and tools for undertaking this type of survey.

7 BIBLIOGRAPHY

Champion Minerals. (n.d.). Is Geothermal Energy Renewable Energy? Retrieved on May 23, 2018, from http://championminerals.com/is-geothermal-energy-renewable-why-is-it-an-efficient-energy-source/

Convention on Biological Diversity. (n.d.). Environmental Impact Assessment. Retrieved on May 23, 2018, from https://www.cbd.int/impact/whatis.shtml

Duggan T (2018). What Is the Importance of Project Scheduling & Its Role in Business Projects? Retrieved on May 29, 2018, from https://yourbusiness.azcentral.com/importance-project-scheduling-its-role-business-projects-9503.html

Harwell M (n.d.). Research Design in Qualitative/Quantitative/ Mixed Methods retrieved on June 05, 2018, from https://www.sagepub.com/sites/default/files/upm-binaries/41165_10.pdf

Hillson, D. (2002). Use a risk breakdown structure (RBS) to understand your risks. Paper presented at Project Management Institute Annual Seminars & Symposium, San Antonio, TX. Newtown Square, PA: Project Management Institute.

ITHACA College library - Primary and Secondary Sources (n.d.). Retrieved on June 05, 2018, from https://library.ithaca.edu/sp/subjects/primary

Mission and Vision Statements (n.d.). Retrieved on June 01, 2018, from http://sustainabledevelopment.govt.lc/about

Module one - Information Sources (n.d.). Retrieved on June 08, 2018 from http://karibouconnections.net/medlibafrica/training_module/pdf/module1.pdf

My Project Guide - Managing Stakeholders Expectations (n.d.). Retrieved on September 14, 2018, from https://mymanagementguide.com/guidelines/project-management/communications-management/managing-stakeholder-expectations/

Ogala P (2005). Paper on Environmental and Social Considerations in Geothermal Energy Development. Retrieved on May 25, 2018 from https://orkustofnun.is/gogn/unu-gtp-sc/UNU-GTP-SC-01-15.pdf

Panorama Environmental INC (2018). Environmental and Social Impact assessment – Saint Lucia Geothermal Resource Exploration Project. Retrieved on May 25, 2018, from http://www.govt.lc/media.govt.lc/www/resources/publications/01-draft-esia-st-lucia-geothermal-exploration-project.pdf

Project Management Institute. (2017). A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017

Project Management Institute. (2013). A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) - Fifth Edition, Project Management Institute, Inc., 2013

Research Gate - Schematic of a typical binary cycle geothermal power plant (n.d.). Retrieved on June 01, 2018, from https://www.researchgate.net/figure/Schematic-of-a-typical-binary-cycle-geothermal-power-plant-7_fig1_283499353

Research Methodology (n.d.). Retrieved on June 07, 2018, from https://research-methodology.net/research-methodology/research-types/

Scribd - Analytical Research. (n.d.). Retrieved on June 05, 2018, from https://www.scribd.com/doc/33329016/Analytical-Research

Stakeholder Engagement Plan – Engagement Technique**[*1]** - Krumovgrad Gold Project (2014). Retrieved on September 14, 2018, from file:///C:/Users/Owner/Desktop/Stakeholder-Engagement-Plan.pdf

Study - Research Methods (n.d.). Retrieved on June 07, 2018, from https://study.com/academy/lesson/research-methodology-approaches-techniques-quiz.html

UNESCO Media Services (2017). A Caribbean strategy to cope with climate change. Retrieved on June 09, 2018, from http://www.unesco.org/new/en/media-services/single-view/news/a_caribbean_strategy_to_cope_with_climate_change/

Vanclay, F (2015). Social Impact Assessment – Guidance for assessing and managing the social impacts of projects. Retrieved on May 22, 2018 from https://www.iaia.org/uploads/pdf/SIA_Guidance_Document_IAIA.pdf

Video Project. (n.d.). Geothermal Energy: A Renewable Option. Retrieved on May 17, 2018, from http://www.videoproject.com/Geothermal-Energy-A-Renewable-Option.html

World Bank Staff (2013). Geothermal as an Opportunity for Growth in the Caribbean. Retrieved on May 17, 2018, from http://documents.worldbank.org/curated/en/202651468230958748/pdf/786080WP015-0G00Box377349B00PUBLIC0.pdf

8 APPENDICES

Appendix 1: FGP Charter

<table>
<tr><th colspan="2">PROJECT CHARTER
Formalizes the project start and confers the project manager with the authority to assign company resources to the project activities. Benefits: it provides a clear start and well defined project boundaries.</th></tr>
<tr><td>Date</td><td>Project Name:</td></tr>
<tr><td>May 2018</td><td>Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia</td></tr>
<tr><td>Knowledge Areas / Processes</td><td>Application Area (Sector / Activity)</td></tr>
<tr><td>Knowledge areas
Project Scope Management
Project Schedule Management
Project Cost Management
Project Communications Management
Project Stakeholder Management
Project Risk Management

Process Groups:
Initiating
Planning
Executing
Monitoring and Evaluation</td><td>Renewable Energy</td></tr>
<tr><td>Start date</td><td>Finish date</td></tr>
<tr><td>May 2018</td><td>November 2018</td></tr>
<tr><td colspan="2">Project Objectives (general and specific)</td></tr>
<tr><td colspan="2">General Objective:
To develop a Project Management Plan for the Development of Geothermal Energy in St Lucia that will ultimately provide a mechanism for monitoring and controlling the environmental and social impact throughout the execution of the project.

Specific Objectives:
• To develop a Scope Management Plan to define, control and allocate the right amount of work necessary to successfully complete the project.
• To create a Schedule Management Plan for the management of the project and to ensure that the deliverables are realized within the established time frame.
• To create a Cost Management Plan to define the processes for managing and controlling the budget and to ensure that the project is completed within the budget</td></tr>
</table>

constraints.

- To develop a Communications Management Plan to ensure that the needs of the project and its stakeholders are met through timely and effective communication.
- To create a Stakeholder Management Plan to identify and categorize project stakeholders, analyze stakeholders' expectations and to develop appropriate strategies for stakeholder engagement.
- To develop a Risk Management Plan to identify and evaluate risks throughout the project life cycle and to implement risk response strategies to mitigate the impact of negative risks and exploit positive risks.

Project purpose or justification (merit and expected results)

The World Bank preliminary assessments indicate significant unexploited geothermal potential, especially in the Eastern Caribbean (St. Lucia included) that can supply base load power for local markets and beyond. Currently, the Government of St Lucia (GOSL) is exploring geothermal energy as a renewable energy option to improve the socio-economic wellbeing of its citizens, reduce consumption of non-renewable fossil fuels, improve ecological health, and strengthen climate change adaptation at the level of community and country.

The purpose of the Project Management Plan is to develop a comprehensive baseline to examine the social and environmental impact of geothermal energy on a community and national level by integrating PMBOK's processes and techniques.

Description of Product or Service to be generated by the Project – Project final deliverables

A report on the development of a Project Management Plan that can provide valuable and insightful information, guide further discussion and research on the Environmental and Social Impact of Geothermal Energy Development in St Lucia.

The plan will consist of subsidiary components which include:

- A detailed Scope Management Plan on work/activities needed to be carried out to determine the environmental and social factors to be considered for Geothermal Energy Development in St Lucia.
- A Schedule Management Plan to provide guidance and direction on how the project schedule will be managed throughout the project in order that the project scope is achieved within the specified time frame.
- A Cost Management Plan to provide the planning and structure necessary to manage and control the costs of the project, and keep costs within the limits of the budget.
- A Communications Management Plan to detail the communications requirement of the project to include information sharing, collection and collation of information and methods/channels of communication.
- A Stakeholder Management Plan to provide the appropriate management strategies to

effectively engage stakeholders throughout the lifecycle of the project, based on the analysis of their needs, interests and potential impact on project success.

- A Risk Management Plan to provide a documented plan for identifying, analyzing, and prioritizing risks and to identify the risk management strategies for both negative and positive risks.

Assumptions

- All stakeholders will be available to provide information to successfully complete the project.
- Community members will willingly participate in the qualitative and quantitative research.
- The Division of Renewable Energy will support this project and provide relevant information.
- Project Scope may change during Project Life Cycle.
- The time allocated for the completion of activities within the Project Management Plan will be sufficient for the completion of the project.
- Timely gathering of primary and secondary research.
- Overall cost of activities may increase due to internal and external factors.
- The budget allocated to conduct research will be sufficient.
- Overall economic conditions will remain the same
- Information provided in the Project Management Plan will be adequately understood and correctly interpreted by stakeholders.
- The needs of the project and its stakeholders will be met through timely and effective communication
- Stakeholders will be accurately identified.
- Stakeholders' expectations will be effectively analyzed.
- Appropriate strategies will be developed for effective stakeholder engagement.
- The risks will be adequately identified.
- The Risk Management Plan will be effective enough to detect and mitigate risks.

Constraints

- A substantial amount of work to complete the Scope Management plan must be accomplished within the established schedule.
- Any delays in obtaining relevant information for the project will impede schedule delivery.
- Completion of Project Scope must be within available budget.
- Effective and various methods of communication must be utilized and must be available to reach relevant stakeholders.
- Lack of willingness to participate in qualitative and quantitative research.
- Limitations of stakeholders to provide relevant information.
- Lack of experience of Project Manager to perform audits at the right time to mitigate risks.

Preliminary risks

Natural disaster can impact schedule as there can be a delay in sourcing, obtaining and collating relevant information for this project.

Budget
General cost estimate for project budget is about XCD50, 500.00

Milestones and dates

Milestone	Start date	End date
Submission of FGP Charter and FGP WBS	May 14, 2018	May 18, 2018
Submission of Introduction Chapter and FGP Schedule	May 21, 2018	May 25, 2018
Submission of Theoretical Framework Chapter	May 28, 2018	June 01, 2018
Submission of Methodological Framework Chapter	June 04, 2018	June 08, 2018
Submission of Executive Summary, Figures/Tables, Bibliography, indexes, Abbreviations	June 11, 2018	June 15, 2018
Acquisition of Signed Charter	June11, 2018	June 15, 2018
Tutorship Phase	**July 31, 2018**	**October 12, 2018**
Develop and Submit Scope Management Plan	August 14, 2018	August 21, 2018
Tutor Review and Corrections Submission	August 22, 2018	August 24, 2018
Develop and Submit Schedule Management Plan	August 27, 2018	August 29, 2018
Tutor Review and Corrections Submission	August 30, 2018	August 31, 2018
Develop and Submit Cost Management Plan	September 03, 2018	September 05, 2018
Tutor Review and Corrections Submission	September 06, 2018	September 07, 2018
Develop and Submit Communications Management Plan	September 10, 2018	September 12, 2018
Tutor Review and Corrections Submission	September 13, 2018	September 14, 2018
Develop and Submit Stakeholder Management Plan	September 17, 2018	September 19, 2018
Tutor Review and Corrections Submission	September 20, 2018	September 21, 2018
Risk Management Plan	September 24, 2018	September 26, 2018
Tutor Review and Corrections Submission	September 27, 2018	September 28, 2018
Develop and Submit Conclusion and	October 01 , 2018	October 03, 2018

Recommendations		
Tutor Review and Corrections Submission	October 04, 2018	October 05, 2018
Final Review by FGP Linguist	October 08, 2018	October 11, 2018
Submit FGP to Tutor	October 11, 2018	October 11, 2018
Final Corrections/Submission of FGP Report	October 12 , 2018	October 16, 2018
Approval of FGP by Tutor	October 17, 2018	October 18, 2018
Final Submission of FGP	October 19, 2018	October 19, 2018
Defense Phase	**October 22, 2018**	**November 13, 2018**
Readership Process	October 22, 2018	November 02, 2018
Amendment of Final FGP	November 05, 2018	November 12, 2018
Upoload of Final FGP	November 13, 2018	November 13, 2018

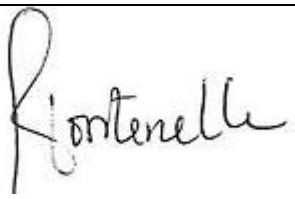
Relevant historical information

St Lucia has a long history of geothermal exploration going back to the 1970's and efforts to determine its potential are ongoing. The World Bank has indicated that there is significant unexploited geothermal potential in St Lucia and other Caribbean Countries including Guadeloupe, which currently has a functional plant. Hence GOSL with assistance from the World Bank, has secured project financing and technical support to advance the Geothermal Resource Development Project.

Stakeholders

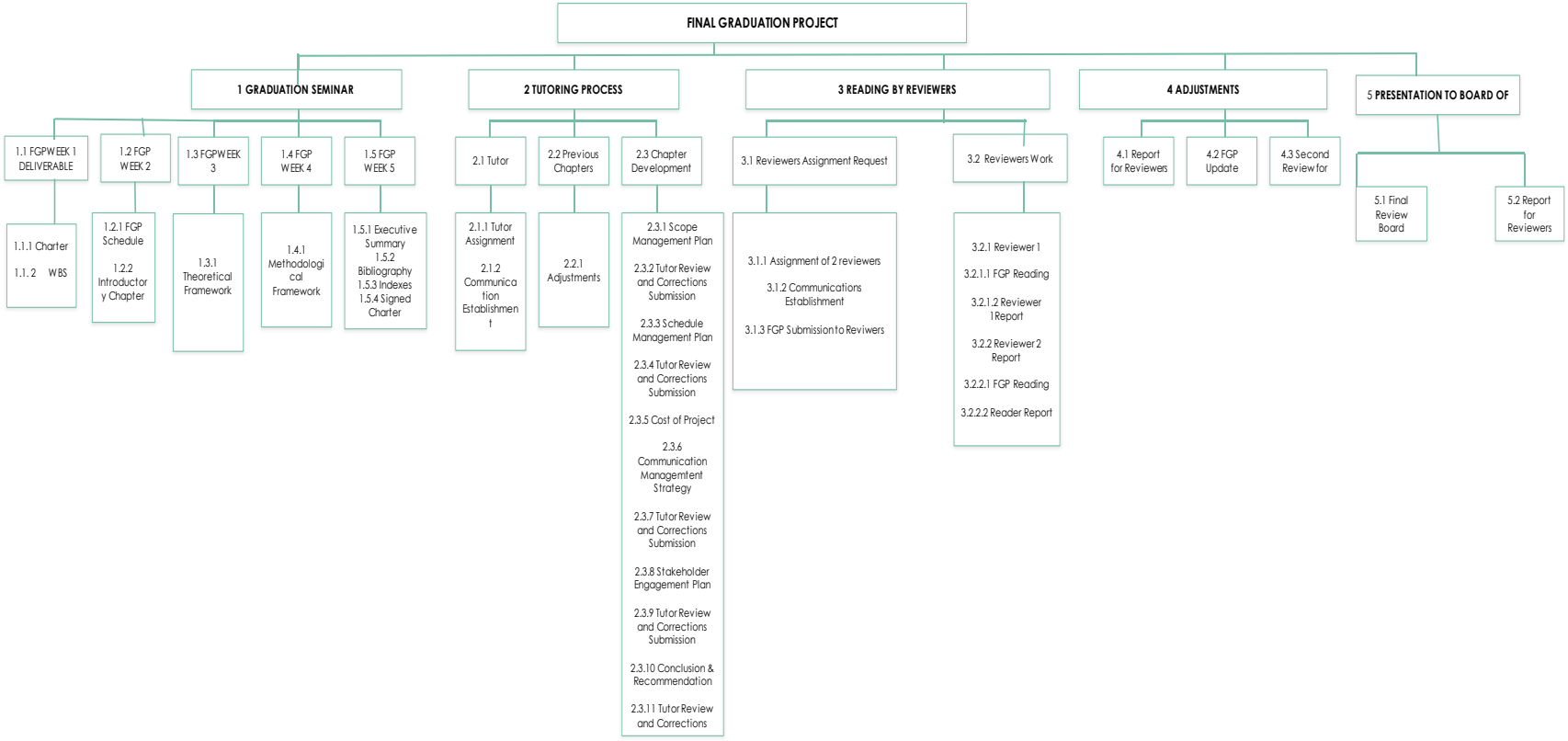
Direct stakeholders:
Project Sponsor
Community members in the Soufriere, Choiseul and Laborie regions
Environmentalists
Consultants on Geothermal Energy project
Community Facilitators

Indirect stakeholders:
Government and People of St Lucia
Family and Friends of Cynthia Fontenelle

Project Manager: Cynthia Fontenelle	**Signature:** 
Authorized by:	**Signature:**

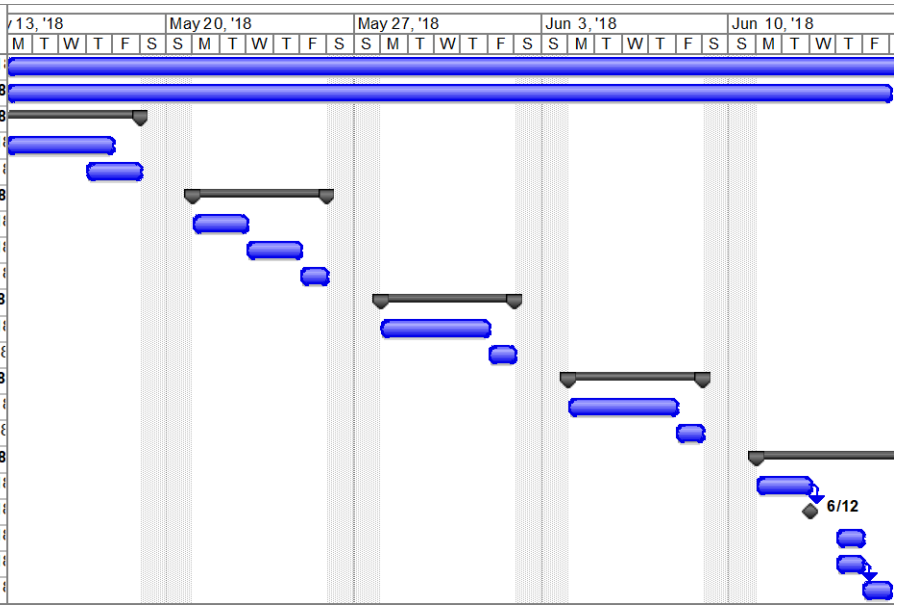
Appendix 2: FGP WBS

PROJECT TITLE	A Project Management Plan for Geothermal Energy Development in St Lucia.		
PROJECT MANAGER	**Cynthia Fontenelle**		

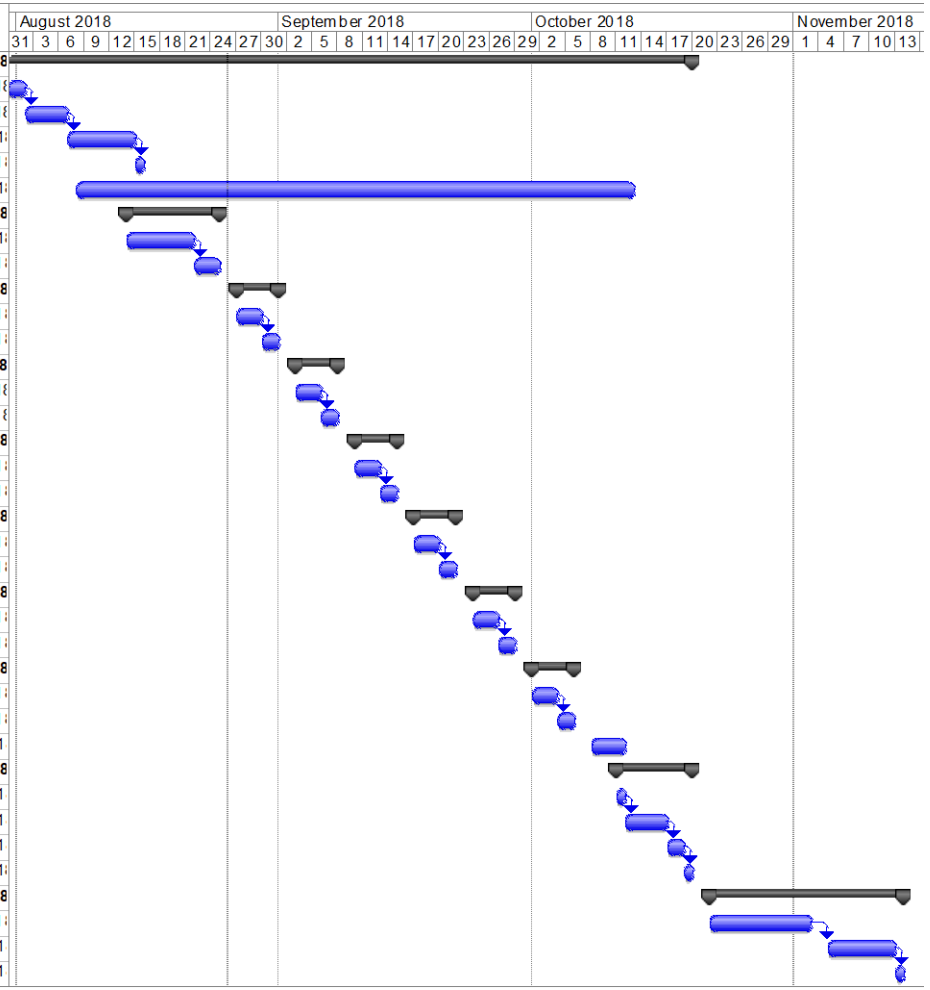


Appendix 3: FGP Schedule

ID	Task Name	Duration	Start	Finish
1	FINAL GRADUATION PROJECT	132 days	Mon 5/14/18	Tue 11/13/18
2	**FINAL GRADUATION SEMINAR**	**25 days**	**Mon 5/14/18**	**Fri 6/15/18**
3	**WEEK 1 DELIVERABLES**	**5 days**	**Mon 5/14/18**	**Fri 5/18/18**
4	Prepare and Complete Charter	4 days	Mon 5/14/18	Thu 5/17/18
5	Prepare and Complete FGP WBS	2 days	Thu 5/17/18	Fri 5/18/18
6	**WEEK 2 DELIVERABLES**	**5 days**	**Mon 5/21/18**	**Fri 5/25/18**
7	Prepare and Complete Introductory Chapter	2 days	Mon 5/21/18	Tue 5/22/18
8	Prepare and Complete FGP Schedule	2 days	Wed 5/23/18	Thu 5/24/18
9	Make adjustments to Week 1 deliverable (if needed)	1 day	Fri 5/25/18	Fri 5/25/18
10	**WEEK 3 DELIVERABLES**	**5 days**	**Mon 5/28/18**	**Fri 6/1/18**
11	Prepare and Complete Theoretical Framework	4 days	Mon 5/28/18	Thu 5/31/18
12	Make adjustments to Week 2 deliverable (if needed)	1 day	Fri 6/1/18	Fri 6/1/18
13	**WEEK 4 DELIVERABLES**	**5 days**	**Mon 6/4/18**	**Fri 6/8/18**
14	Prepare and Complete the Methodological Framewor	4 days	Mon 6/4/18	Thu 6/7/18
15	Make adjustments to Week 3 deliverable (if needed)	1 day	Fri 6/8/18	Fri 6/8/18
16	**WEEK 5 DELIVERABLES**	**112 days**	**Mon 6/11/18**	**Tue 11/13/18**
17	Prepare and Complete Executive Summary	2 days	Mon 6/11/18	Tue 6/12/18
18	Draft Bibliography	0 days	Tue 6/12/18	Tue 6/12/18
19	Prepare Indexes	1 day	Thu 6/14/18	Thu 6/14/18
20	Make adjustments to Week 4 deliverable (if needed)	1 day	Thu 6/14/18	Thu 6/14/18
21	Get Signed Charter	1 day	Fri 6/15/18	Fri 6/15/18



ID	Task Name	Duration	Start	Finish
22	**TUTORSHIP PHASE**	**59 days**	**Tue 7/31/18**	**Fri 10/19/18**
23	Get Tutor	2 days	Tue 7/31/18	Wed 8/1/18
24	Establish Communications	3 days	Thu 8/2/18	Mon 8/6/18
25	Commence Tutor Assignment	6 days	Tue 8/7/18	Tue 8/14/18
26	Make any adjustments to previous deliverables (i	1 day	Wed 8/15/18	Wed 8/15/18
27	Chapter Development (results)	48 days	Wed 8/8/18	Fri 10/12/18
28	**Scope Management Plan**	**9 days**	**Tue 8/14/18**	**Fri 8/24/18**
29	Draft and submit the Scope Management Pla	6 days	Tue 8/14/18	Tue 8/21/18
30	Make Corrections/Adjustments (if any)	3 days	Wed 8/22/18	Fri 8/24/18
31	**Schedule Management Plan**	**5 days**	**Mon 8/27/18**	**Fri 8/31/18**
32	Draft and submit the Schedule Management	3 days	Mon 8/27/18	Wed 8/29/18
33	Make Corrections/Adjustments (if any)	2 days	Thu 8/30/18	Fri 8/31/18
34	**Cost Management Plan**	**5 days**	**Mon 9/3/18**	**Fri 9/7/18**
35	Draft and submit Cost Management Plan	3 days	Mon 9/3/18	Wed 9/5/18
36	Make Corrections/Adjustments (if any)	2 days	Thu 9/6/18	Fri 9/7/18
37	**Communications Management Plan**	**5 days**	**Mon 9/10/18**	**Fri 9/14/18**
38	Draft and Submit the Communications Mana	3 days	Mon 9/10/18	Wed 9/12/18
39	Make Corrections/Adjustments (if any)	2 days	Thu 9/13/18	Fri 9/14/18
40	**Stakeholder Management Plan**	**5 days**	**Mon 9/17/18**	**Fri 9/21/18**
41	Draft/Submit the Stakeholder Management P	3 days	Mon 9/17/18	Wed 9/19/18
42	Make Corrections/Adjustments (if any)	2 days	Thu 9/20/18	Fri 9/21/18
43	**Risks Management Plan**	**5 days**	**Mon 9/24/18**	**Fri 9/28/18**
44	Draft/Submit the Risks Management Plan	3 days	Mon 9/24/18	Wed 9/26/18
45	Make Corrections/Adjustments (if any)	2 days	Thu 9/27/18	Fri 9/28/18
46	**Conclusion and Recommendation**	**5 days**	**Mon 10/1/18**	**Fri 10/5/18**
47	Draft and Submit Conclusion and Recomme	3 days	Mon 10/1/18	Wed 10/3/18
48	Make Corrections/Adjustments (if any)	2 days	Thu 10/4/18	Fri 10/5/18
49	Final Perusal of FGP by Linguist	4 days	Mon 10/8/18	Thu 10/11/18
50	**Submit FGP to Tutor**	**7 days**	**Thu 10/11/18**	**Fri 10/19/18**
51	Submit FGP	1 day	Thu 10/11/18	Thu 10/11/18
52	Submit and Make Corrections/Adjustments (i	3 days	Fri 10/12/18	Tue 10/16/18
53	Approval of FGP by Tutor	2 days	Wed 10/17/18	Thu 10/18/18
54	Final Submission of FGP	1 day	Fri 10/19/18	Fri 10/19/18
55	**DEFENSE PHASE**	**17 days**	**Mon 10/22/18**	**Tue 11/13/18**
56	Readership Process	10 days	Mon 10/22/18	Fri 11/2/18
57	Amendment of Final FGP	6 days	Mon 11/5/18	Mon 11/12/18
58	Upload of Final FGP	1 day	Tue 11/13/18	Tue 11/13/18



Appendix 4: Project Management Plan WBS Dictionary

WBS Level	WBS Code	WBS Element Name	Description of Work	Deliverable(s)	Committed Resources	Comments
1	1	**Project Management Plan**	To develop a Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia.	A Project Management Plan Report	Project Sponsor Project Manager Project Team	
	1.1	Develop Project Charter	Details the purpose, objectives and deliverables, milestones, risks, assumptions and constraints of the project.	Project Charter	Project Sponsor Project Manager	Verification and approval of Project Charter is required prior to commence ment of project.
	1.2	Develop Scope Management Plan	Details work required to successfully complete the project. Tasks are detailed in the WBS and WBS Directory.	Scope Management Plan	Project Manager Project Team	
	1.3	Develop Schedule Management Plan	Provides guidance and direction on how the project schedule will be managed as itemized in the Schedule Activity List and Milestones.	Schedule Management Plan	Project Manager Project Scheduler	
	1.4	Develop Cost Management Plan	Management and control of the project costs.	Cost Management Plan	Project Manager Financial Officer	

WBS Level	WBS Code	WBS Element Name	Description of Work	Deliverable(s)	Committed Resources	Comments
	1.5	Develop Risks Management Plan	To Identify, analyze, and prioritize risks and develop risk management strategies for both negative and positive risks.	Risk Management Plan	Project Manager Project Team	
	1.6	Develop Stakeholder Management Plan	To develop management strategies for stakeholder engagement.	Stakeholder Management Plan	Project Manager Project Team	
	1.7	Develop Communications Management Plan	To detail the communications requirement of the project to include information sharing, collection and collation of information and methods/channels of communication.	Communications Management Plan	Project Manager Project Team	
2	2	**PROJECT COLLECT REQUIREMENTS**				
	2.1	**Literature Review**				
	2.1.1	Review of historical information on geothermal exploration in St Lucia	Perform extensive documentary or secondary review of existing reports and initiatives.	Draft Report	Project Team	
	2.1.2	Review of Past ESIA Research	Gather information on Past ESIA research.	Draft Report	Project Team	
	2.1.3	Review of ESIA on Geothermal Energy Development in Guadeloupe	Gather ESIA information from the Geothermal Energy Development Project in Guadeloupe.	Draft Report	Project Manager Project Team	
	2.2	**Field Research**				

WBS Level	WBS Code	WBS Element Name	Description of Work	Deliverable(s)	Committed Resources	Comments
	2.2.1	Determine Population Size	Determine population size at the 3 designated locations.	Agreement of population size	Project Manager Project Sponsor	
	2.2.2	Develop Sample Size	Choosing sample size to be used for the surveys.	Agreement on sample size	Project Manager Project Team	
	2.2.3	Select Target Audience	Selection of stakeholders, community members at the 3 locations to be part of the survey.	Target Market Selection Plan	Project Manager Project Team	
	2.2.4	Develop Method of survey administration	Determine methods of questionnaire administration (electronic or physical) and mode of technical survey.	Agreement on survey administration	Project Manager	
	2.2.5	Design questionnaire for surveys	Determine number of questions and types of questions (open-ended/close-ended).	Survey Questionnaire	Project Manager Project Team	
	2.2.6	Design Focus Group Meetings questionnaire	Determine types of questions for key stakeholders: Residents, Environmentalists and Agencies.	Focus Group Questionnaire	Project Manager Project Team	
	2.2.7	Plan strategy for Key stakeholder Interviews	Types of Interviews: In-depth interviews with identified stakeholders, either face to face where possible or via, phones. Determine the relevant questions that will realize project objectives.	Strategy for Interview	Project Manager Project Team	
3	3	**PROJECT REQUIREMENTS PLAN**				
	3.1	**Social Impact Plan**				

WBS Level	WBS Code	WBS Element Name	Description of Work	Deliverable(s)	Committed Resources	Comments
	3.1.1	Design map of land ownership and use	Develop a map to determine land ownership and use supported by desk- based profile of the land owners or users (for monitoring livelihood restoration), or land use rights transfer procedures.	Map of Land Ownership and Use	Project Team	
	3.1.2	Review historical data on volcanic hazards and seismic activities	Review data to determine vulnerability of the 3 areas in terms of volcanic and seismic activities.	Draft Report	Project Team	
	3.1.3	Design Survey instrument for the assessment of the impact of short term disruptions to farmers and community members	Design survey instrument to conduct survey at the 3 locations with at least 100 participants per area to ascertain impact of livelihood.	Questionnaire	Project Team	
	3.1.4	Design survey instrument for the Community Perception Survey	Design Perception Survey to conduct survey at the 3 locations with at least 100 participants per area to ascertain community feelings, opinions on Geothermal Energy Development.	Questionnaire	Project Team	
	3.1.5	Design survey instrument to determine the number of inhabitants in each community	Survey of the inhabitants in each of the 3 communities.	Questionnaire	Project Team	
	3.2	**Environmental Impact Plan**				
	3.2.1	Design a habitat and bio-diversity map for the 3	To determine the biodiversity in the 3 areas and note presence of any	Map	Project Team	

WBS Level	WBS Code	WBS Element Name	Description of Work	Deliverable(s)	Committed Resources	Comments
		locations	endangered species.			
	3.2.2	Selection of Sound Measurement Instrument to conduct Noise Monitoring Survey at the 3 locations	Selection of Sound Measurement Instrument to conduct a baseline Noise Monitoring Survey at representative locations including households, hotels, nearby communities which could be affected by noise emissions during drilling.	Sound Measurement Instrument	Project Technical Team	
	3.2.3	Selection of Method for sampling Air quality at the 3 locations	Selection of Air Quality Method to conduct a baseline Air Quality Monitoring Survey at potential receptor sites within the project area of influence including households, tourism areas, roads, and potential drilling sites.	Air Quality Monitoring Instrument	Project Technical Team	
	3.2.4	Selection of method for assessing and inspecting Water Quality at the 3 locations	Selection of Water Inspection Method to conduct a baseline Water Inspection Survey at reservoirs and households.	Water Inspection Instrument	Project Technical Team	
	3.2.5	Selection of a Monitoring System for soil erosion due to site drilling at the 3 locations	A Soil Monitoring System to conduct a baseline survey on potential soil erosion at drilling sites.	Soil Monitoring System	Project Technical Team	
4	4	**PROJECT COMPLETION**				
	4.1	Analysis of Findings	Thorough analysis of information and Development of requisite Report.	Data Analysis	Project Manager Project Team	

WBS Level	WBS Code	WBS Element Name	Description of Work	Deliverable(s)	Committed Resources	Comments
	4.2	Development and Submission of Results	Development of Report. Submission of Report.	Final Report	Project Manager Project Team	
	4.3	Validation & Acceptance	Validate and Acceptance of report.	Final Report	Project Sponsor Project Manager	

Appendix 5: Project Deliverable Acceptance Document

Date	
Project Name	Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia
Project Sponsor	Michael Pistone
Project Manager	Cynthia Fontenelle
Item Version	

Purpose

The purpose of this Project Deliverance Acceptance Form is to provide verification that all project work is complete and deliverables have been reviewed and accepted by the Project Sponsor and Manager.

Complete Acceptance Criteria

This document acknowledges formal acceptance of the deliverable. All phase acceptance documents must be attached.

Place a (√) in the box below for deliverable submitted for acceptance

PROJECT REQUIREMENTS PLAN
Social Impact Plan
Map of land ownership and use □
Draft Report on historical data on volcanic hazards and seismic activities □
Questionnaire on the assessment of the impact of short term disruptions to farmers and community members □
Questionnaire on the Community Perception Survey □

Questionnaire to determine the number of inhabitants in each community □
Environmental Impact Plan
Habitat and bio-diversity map for the 3 locations □
Sound Measurement Instrument to conduct Noise monitoring survey at the 3 locations □
Air Quality Monitoring Instrument for sampling Air quality at the 3 locations □
Water Inspection Instrument for assessing and inspecting Water quality at the 3 locations □
Soil Monitoring System for soil erosion due to site drilling at the 3 locations □
PROJECT COMPLETION
Data Analysis of Findings □
Results (Report on the Project Management Plan) □

Approved□ Denied□

Date:

_____

By signing below, I _____, in my capacity as _____, formally accept the deliverable described above.

…… ……..

Signature - Project Sponsor Signature – Project Manager

Appendix 6: Change Request Form

Project Name	Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia	Project Manager	Cynthia Fontenelle
Project Number		Project Sponsor	Michael Pistone
Date		Requestor	

Describe the Requested Change

Describe the Reason for the Request

Risk Identification/Analysis

Impact Analysis	
Work to be Modified	Version Number
1.	
2.	
3.	
Describe the impact of the suggested change to work that is already complete.	

Schedule Impact			
New Deliverables Description	Effort Hours	Date Required	Impact to Other Delivery Dates
1.			
2.			
3.			
Based on the impact, state the estimated date for implementing the requested change. State the new estimated project completion date.			

Budget Impact			
New Deliverables Description	Lessen or Eliminate Other Expenses? Please describe.	Cost of New Deliverable	Total
1.			
2.			
3.			
Describe the overall impact to budget/cost.			

Decision	
☐ Approved	☐ Rejected
☐ Approved with modifications	☐ Deferred

Justifications

Additional Comments

_____ _____

Approver's Printed Name Date

_____

Title

_____

Signature

Appendix 7: Schedule Activity List

Project Name	Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia	**Date**	November 01, 2018
Project Number	1	**Document Number**	1
Project Manager	Cynthia Fontenelle	**Project Sponsor**	Michael Pistone

Activity Number	Activity Name	Detailed Activity Description	Assigned To	Status / Comments
1	**PROJECT COLLECT REQUIREMENTS**			
1.1	**Literature Review**			
1.1.1	Review of historical information on geothermal exploration in St Lucia	Perform extensive documentary or secondary review of existing reports and initiatives	Project Team	
1.1.2	Review of Past ESIA Research	Gather information on Past ESIA research	Project Team	
1.1.3	Review of ESIA on Geothermal Energy Development in Guadeloupe	Gather ESIA information from the Geothermal Energy Development Project in Guadeloupe	Project Manager Project Team	
1.2	**Field Research**			
1.2.1	Determine Population	Determine population size at the 3 designated	Project Manager	

	Size	locations	Project Sponsor	
1.2.2	Develop Sample Size	Choosing sample size to be used for the surveys	Project Manager Project Team	
1.2.3	Select Target Audience	Selection of stakeholders, community members at the 3 locations to be part of the survey	Project Manager Project Team	
1.2.4	Develop Method of Survey Administration	Determine methods of questionnaire administration (electronic or physical) and mode of technical survey	Project Manager	
1.2.5	Design questionnaire for surveys	Determine number of questions and types of questions (open-ended/close-ended)	Project Manager Project Team	
1.2.6	Design Focus Group Meetings questionnaire	Determine types of questions for key stakeholders: Residents, Environmentalists and Agencies	Project Manager Project Team	
1.2.7	Plan strategy for Key Stakeholder Interviews	Types of Interviews: In-depth interviews with identified stakeholders either face to face where possible or via, phones Determine the relevant questions that will realize project objectives	Project Manager Project Team	
2	**PROJECT REQUIREMENTS PLAN**			
2.1	**Social Impact Plan**			
2.1.1	Design map of land ownership and use	Develop a map to determine land ownership and use supported by desk-based profile of the land owners or users (for monitoring livelihood restoration), or land use rights	Project Team	

		transfer procedures		
2.1.2	Review historical data on volcanic hazards and seismic activities	Review data to determine vulnerability of the 3 areas in terms of volcanic and seismic activities	Project Team	
2.1.3	Design Survey Instrument for the assessment of the impact of short term disruptions to farmers and community members	Design survey instrument to conduct survey at the 3 locations with at least 100 participants per area to ascertain impact of livedoid	Project Team	
2.1.4	Design Survey Instrument for the Community Perception Survey	Design Perception Survey to conduct survey at the 3 locations with at least 100 participants per area to ascertain community feelings, opinions on Geothermal Energy Development	Project Team	
2.2	**Environmental Impact Plan**			
2.2.1	Design a habitat and bio-diversity map for the 3 locations	To determine the biodiversity in the 3 areas and note presence of any endangered species	Project Team	
2.2.2	Selection of Sound Measurement Instrument to conduct Noise Monitoring Survey at the 3 locations	Selection of Sound Measurement Instrument to conduct a baseline Noise Monitoring Survey at representative locations including households, hotels, nearby communities which could be affected by noise emissions during drilling	Project Technical Team	
2.2.3	Selection of Method for Sampling Air Quality at the 3	Selection of Air Quality Method to conduct a baseline Air Quality Monitoring Survey at potential receptor sites within the project	Project Technical Team	

	locations	area of influence, including households, tourism areas, roads, and potential drilling sites		
2.2.4	Selection of Method for Assessing and Inspecting Water quality at the 3 locations	Selection of Water inspection Method to conduct a baseline Water Inspection Survey at reservoirs and households	Project Technical Team	
2.2.5	Selection of a Monitoring System for Soil Erosion due to site drilling at the 3 locations	A Soil Monitoring System to conduct a baseline survey on potential soil erosion at drilling sites	Project Technical Team	
3	**PROJECT COMPLETION**			
3.1	Analysis of Findings	Thorough analysis of information and development of requisite report	Project Manager Project Team	
3.2	Development and Submission of Results	Development of Report Submission of Report	Project Manager Project Team	
3.3	Validation & Acceptance	Validation and Acceptance of report	Project Sponsor Project Manager	

Appendix 8: Milestone List

Project Name	**Project Management Plan on the Environmental and Social Impact of Geothermal Energy Development in Saint Lucia**	**Date**	**November 01, 2018 – May 01, 2019**
Project Number	**1**	**Document Number**	
Project Manager	**Cynthia Fontenelle**	**Project Sponsor**	**Michael Pistone**

Milestone Number	Milestone	Requirement – Mandatory/Optional	Start Date	End Date	Means of Verification
1.1.1	Review of Historical Information on Geothermal Exploration in St Lucia	Mandatory	November 01, 2018	November 21, 2018	Draft Report
1.1.2	Review of Past ESIA Research	Mandatory	November 01, 2018	November 21, 2018	Draft Report
1.1.3	Review of ESIA on Geothermal Energy Development in Guadeloupe	Mandatory	November 01, 2018	November 21, 2018	Draft Report
1.2.1	Determine Population Size	Mandatory	November 22, 2018	November 28, 2018	Records from Statistics Department
1.2.2	Develop Sample Size	Mandatory	November 29, 2018	December 01, 2018	Record of Meetings on Agreement of

					sample size based on population
1.2.3	Select Target Audience	Mandatory	December 03, 2018	December 04, 2018	Development of a Target Market Strategy
1.2.4	Develop Method of Survey Administration	Mandatory	December 05, 2018	December 06, 2018	Survey method options based on past research
1.2.5	Design questionnaire format for surveys	Mandatory	December 05, 2018	December 06, 2018	Survey Questionnaire based on past research
1.2.6	Design Focus Group Meetings Questionnaire	Mandatory	December 05, 2018	December 06, 2018	Focus Group Questionnaire based on past research
1.2.7	Plan strategy for Key Stakeholder Interviews/Meetings	Mandatory	December 05, 2018	December 06, 2018	Strategy formulation for stakeholder interviews
2.1.1	Design Map of Land Ownership and Use	Mandatory	December 06, 2018	December 13, 2018	Land Ownership Mapping based on information from Land Registry

2.1.2	Review historical data on volcanic hazards and seismic activities	Mandatory	December 06, 2018	December 13, 2018	Data from UWI Seismic Research Centre
2.1.3	Design Survey Instrument for the assessment of the impact of short term disruptions to farmers and community members	Mandatory	December 14, 2018	December 18, 2018	Survey Questionnaire based on past research
2.1.4	Design Survey Instrument for the Community perception survey	Mandatory	December 14, 2018	December 18, 2018	Perception Survey Questionnaire based on past research
2.2.1	Design a Habitat and Bio-diversity map for the 3 locations	Mandatory	December 19, 2018	December 21, 2018	Habitat and Biodiversity Mapping based on information from Department of Sustainable Development
2.2.2	Selection of Sound Measurement Instrument to conduct Noise Monitoring survey at the 3 locations	Mandatory	December 21, 2018	December 27, 2018	Selection of Sound Measurement instrument based on International Standards
2.2.3	Selection of Method for	Mandatory	December 21,	December 27,	Selection of Air

	sampling Air Quality at the 3 locations		2018	2018	Quality Measurement instrument based on International Standards
2.2.4	Selection of method for assessing and inspecting Water Quality at the 3 locations	Mandatory	December 21, 2018	December 27, 2018	Selection of Water Quality Inspection based on International Standards
2.2.5	Selection of a Monitoring System for soil erosion due to site drilling at the 3 locations	Mandatory	December 21, 2018	December 27, 2018	Selection of a Monitoring System for soil erosion based on soil geology
3.1	Analysis of Findings	Mandatory	December 28, 2018	January 03, 2019	Draft Report
3.2	Development and Submission of Results	Mandatory	January 04, 2019	January 08, 2019	Final Report
3.3	Validation & Acceptance	Mandatory	January 09, 2019	January 09, 2019	Final Report

Appendix 9: Project Team Directory

ROLE	NAME	TITLE	ORGANIZATION/ DEPARTMENT	EMAIL	PHONE
Project Sponsor	Michael Pistone	Director	Energy Division	mpistone@energyslu.com	451 9956
Project Manager	Cynthia Fontenelle	Project Manager	CF Project Consultancy	fontenellecynthia@cfpc.com	484 0000
Project Team - Technical	Carlton Smith Johana Potton Mesa Barton Leona Markesan	Team Leader Team Member Team Member Team Member	CF Project Consultancy	Smithc@cfpc.com Pottonj@cfpc.com Bartonm@cfpc.com Markesanl@cfpc.com	452 2944 452 2945 452 2946 452 2947
Project Team – Non-Technical	Marva Hornstone Kevon Jacobson Lemon Sunga	Team Leader Team Member/ Communications Team Member	CF Project Consultancy	Horstonem@cfpc.com Jacobsonk@cfpc.com Sungal@cfpc.com	452 2948 452 2949 452 2950
Project Scheduler	Mark Jhansi	Project Scheduler	CF Project Consultancy	Jhansim@cfpc.com	452 2951
Project Finance Manager	Claudette Jn Paul	Finance Manager	CF Project Consultancy	JnPaulc@cfpc.com	452 2952

Appendix 10: Communications Requirements Matrix

COMMUNICATION	PURPOSE	MEDIUM	FREQUENCY	AUDIENCE	OWNER	DELIVERABLE
Kickoff Meeting	To Introduce project. Review objectives and goals.	In person / Face-to-face	Once	Project Team Project Sponsor Stakeholders	Project Manager	Agenda; Minutes of Meeting
Project Team Meetings	Review status of project	Face-to-face or Conference call	Weekly	Project Team	Project Manager	Agenda; Minutes of Meeting; Project Schedule
Technical & Creative Design Meetings	Discuss, review technical & design problems and solutions for the selection of the Air, Noise and Water Equipment	In person / Face-to-face	As needed	Technical Team	Technical Team Leader	Agenda; Minutes of Meeting
Monthly Project Status Meetings	Update Sponsor on project status.	Face-to-face or Conference call	Monthly	Project Manager Project Sponsor	Project Manager	Slide Presentation Project Schedule
Project Status Reports	Detailed report on project status including progress, costs, and problems.	Email	Monthly	Project Manager and Team Project Sponsor	Project Manager	Project Status Report Schedule and Budget variances Report

Appendix 11: Stakeholder Engagement Strategy (Source – C. Fontenelle; author of study)

ID#	Stakeholders	Means of Communications	Updates – Means of Communications	Tools and Tactics	Plans for Engagement – Power & Interest (Keep satisfied, Manage closely, Monitor, Keep informed)
1	Government - Sponsor	Meetings, Emails, Conference or Telephone calls		Power Point Presentations Documents	Manage closely due to high power and high interest as well as to keep satisfied and informed.
2	Environmentalists - Environmental Agencies	Focus Groups discussions, Executive Interviews, Meetings		Study reports and maps of bio-diversity in the 3 proposed areas, Presentations, Website, Media driven communication	Keep Informed due to low power and high interest. Adequately inform these stakeholders and talk to them to ensure that no major issues are arising.
3	Professional Conservators - Conservation & Heritage Organizations	Focus Groups discussions, Meetings		Study reports on conservation and heritage site reports, Executive Interviews, Website, Media driven communication	Keep Informed due to low power and high interest. Adequately inform these stakeholders and talk to them to ensure that no major issues are arising.
4	Land Owners in the proposed areas of	Community Meetings Focus Groups		Questionnaire and Surveys	Manage closely due to high power and high

	Choiseul/Soufriere and Laborie	discussions Interviews with affected Land Owners			interest as well as to keep satisfied and informed.
5	Community Members in the proposed areas of Choiseul/Soufriere and Laborie	Community Meetings Focus Groups discussions		Questionnaire and Surveys	Manage closely due to high power and high interest as well as to keep satisfied and informed.
6	Residents close to the proposed areas of Choiseul/Soufriere and Laborie	Community Meetings Focus Groups discussion		Questionnaire and Surveys	Keep informed and monitor as interest can vary among residents; low to medium interest and low power.
7	Hotel & Tourism Sector	Emails Meetings Workshops		Focus Group Presentations, Forums/ Meetings, Reports, Workshop Evaluation Questionnaires, Website, Media driven communication	Keep Informed due to low power and high interest. Adequately inform these people and talk to them to ensure that no major issues are arising.
8	The St Lucia Electricity Services Ltd	Emails Meetings		Presentations Meetings	Manage closely due to high power and high interest, as well as to keep informed.
9	World Bank	Emails Meetings		Presentations Meetings	Manage closely due to high power and high interest as well as to keep satisfied and informed.

Appendix 12: Risk Register (Source – C. Fontenelle; author of study)

IMPACT SCALE LEGEND	
Scale	**Impact**
LOW	ACCEPTABLE LITTLE TO NO EFFECT ON EVENT
MEDIUM	TOLERABLE EFFECTS ARE FELT, BUT NOT CRITICAL TO OUTCOME
HIGH	UNDESIRABLE SERIOUS IMPACT TO THE COURSE OF ACTION AND OUTCOME
VERY HIGH	INTOLERABLE COULD RESULT IN PROJECT FAILURE

PROBABILITY SCALE LEGEND	
Scale	**Probability**
1	IMPROBABLE RISK IS UNLIKELY TO OCCUR
2	POSSIBLE RISK WILL LIKELY OCCUR
3	PROBABLE RISK WILL OCCUR

RISK CODE	RISKS	CONSEQUENCE	OWNER	DATE RE-PORTED	LAST UP-DATED	PROBABILITY	IMPACT	RISK RESPONSE STRATEGY	STATUS OPEN/ CLOSE
3.1	Weather Conditions	Natural disaster can impact schedule as there can be a delay in sourcing, obtaining and collating relevant information	Mark Jhansi	Sept 13, 2018		3	High	Accept by implementing a Natural Disaster Management Operations Plan to safeguard any technical equipment and supplies to minimize the effect of the natural phenomena.	Open

		for the project.							
3.2	Bio-diversity Habitat Disturbances	Environmentalist and Conservators may delay project if they plan rallies against the project.	Leona Markesan	Sept 13, 2018		2	Medium	Mitigate by organizing events with stakeholders to keep them informed and capture their interest on the benefits of project.	Open
3.3	Challenges to gain access to literature review within the stipulated time frame	Inability to obtain relevant information can affect integrity of research as well as impact schedule.	Marva Hornstone	Sept 13, 2018		2	Low	Escalate as Sponsor may be better suited and more resourceful in getting required information due to his position in Government.	Open
3.4	Lack of willingness of community members to participate in qualitative and quantitative	Inability to obtain relevant information can affect integrity of research as	Lemon Sunga	Sept 13, 2018		3	High	Mitigate by ongoing outreach programs to sensitize the community members on the importance of project and by taking into consideration their needs	Open

	research	well as impact schedule.						and culture.	
3.5	Inadequate project funding/ Untimely release of funds	Negatively impact schedule and deliverables.	Kevon Jacobson	Sept 13, 2018		3	Very High	Escalate as the Project Sponsor has the authority to request and push for funds.	Open
3.6	Inadequate Stakeholder Engagement	Scope changes, project delays, and project failures.	Johana Potton	Sept 13, 2018		2	Very high	Mitigate through adherence to bi-weekly stakeholder charrettes reports to resolve conflicts and map solutions.	Open
3.7	Poor communication and interpersonal skills	Poor project work/project failure. Inability to meet stakeholders' needs and expectations. Inability to realize project deliverables.	Carlton Smith	Sept 13, 2018		2	Medium	Mitigate by effective response of the Project Manager in addressing the root cause of the deficient communication; this can be done through individual meetings, mediation and a revision of the Communication Management Plan. Also contract a specialized company to dictate a workshop related to communication and coaching for the Project	Open

								Team.	
3.8	Unavailability of designated technical experts	A key area of the project can be delayed – the technical aspect of the project is a key area for the effective completion of the project.	Mark Jhansi	Sept 13, 2018		3	High	Mitigate by ensuring that assigned technical experts work solely on this project.	Open
3.9	Poor cost management	Inability to keep to defined budget can result in additional cost that the Sponsor cannot bear, and lack of resources to complete the project.	Mark Knight	Sept 13, 2018		3	High	Mitigate by ensuring that the Project Finance Manager inspects every deliverable before releasing funds.	Open

3.10	Changes to core team	Disruption to work flow.	Mesa- Barton	Sept 13, 2018		1	Low	Accept as team members may opt to leave the organisation for various reasons.	Open

Appendix 13: FGP Letter from Linguist

MARGARET HAYNES-EDGAR
P. O. Box 330
Castries, St. Lucia. W. I.
Tel : (758) -716-7012

October 9, 2018

Universidad Para La Cooperacion Internacional
Costa Rica

To Whom It May Concern:

RE: Review of Final Graduation Project submitted by Cynthia Fontenelle in partial fulfillment of the requirements for the Master in Project Management (MPM) Degree

I, Margaret Haynes-Edgar, currently a Teacher of English Language and Literature at the Entrepot Secondary School, have taught English Language at various levels within the Education System in Saint Lucia during the past thirty five years. As a Teacher certified by the University of the West Indies School of Education and a bearer of a Bachelor of Arts Degree in English from the University of the West Indies (Mona Campus) with First Class Honours, I have prepared students for local and regional examinations. I have also served as an examiner at the local and regional level and participated in item preparation and editing of local examinations.

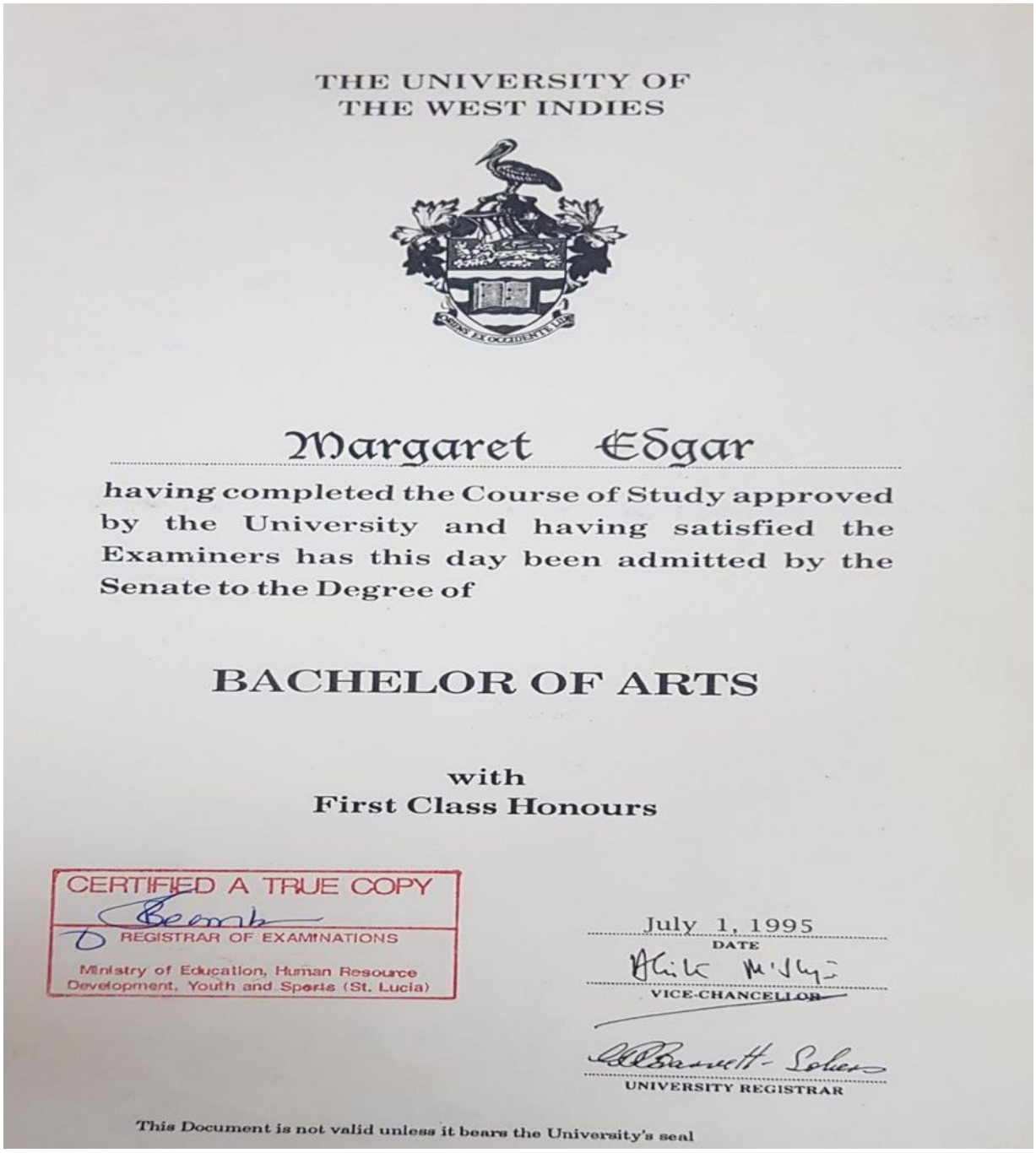
I hereby confirm that Cynthia Fontenelle has made all the corrections to the Final Graduation Project Document as I have advised. It is my opinion that the document demonstrates acceptable usage of the structures of the English Language and accuracy of its mechanics. The document therefore meets the standards expected of a dissertation presented in partial fulfillment of the requirements for a degree at the Masters level.

MEdgar

Margaret Haynes-Edgar
Teacher of English Language
Entrepot Secondary School

"Fear God & Keep his Commandments: For this is the whole duty of man" Ecc 12:13

Appendix 14: Linguist Credentials (BA in Language Arts)



THE UNIVERSITY OF
THE WEST INDIES

Margaret Edgar

having completed the Course of Study approved by the University and having satisfied the Examiners has this day been admitted by the Senate to the Degree of

BACHELOR OF ARTS

with
First Class Honours

CERTIFIED A TRUE COPY
REGISTRAR OF EXAMINATIONS
Ministry of Education, Human Resource Development, Youth and Sports (St. Lucia)

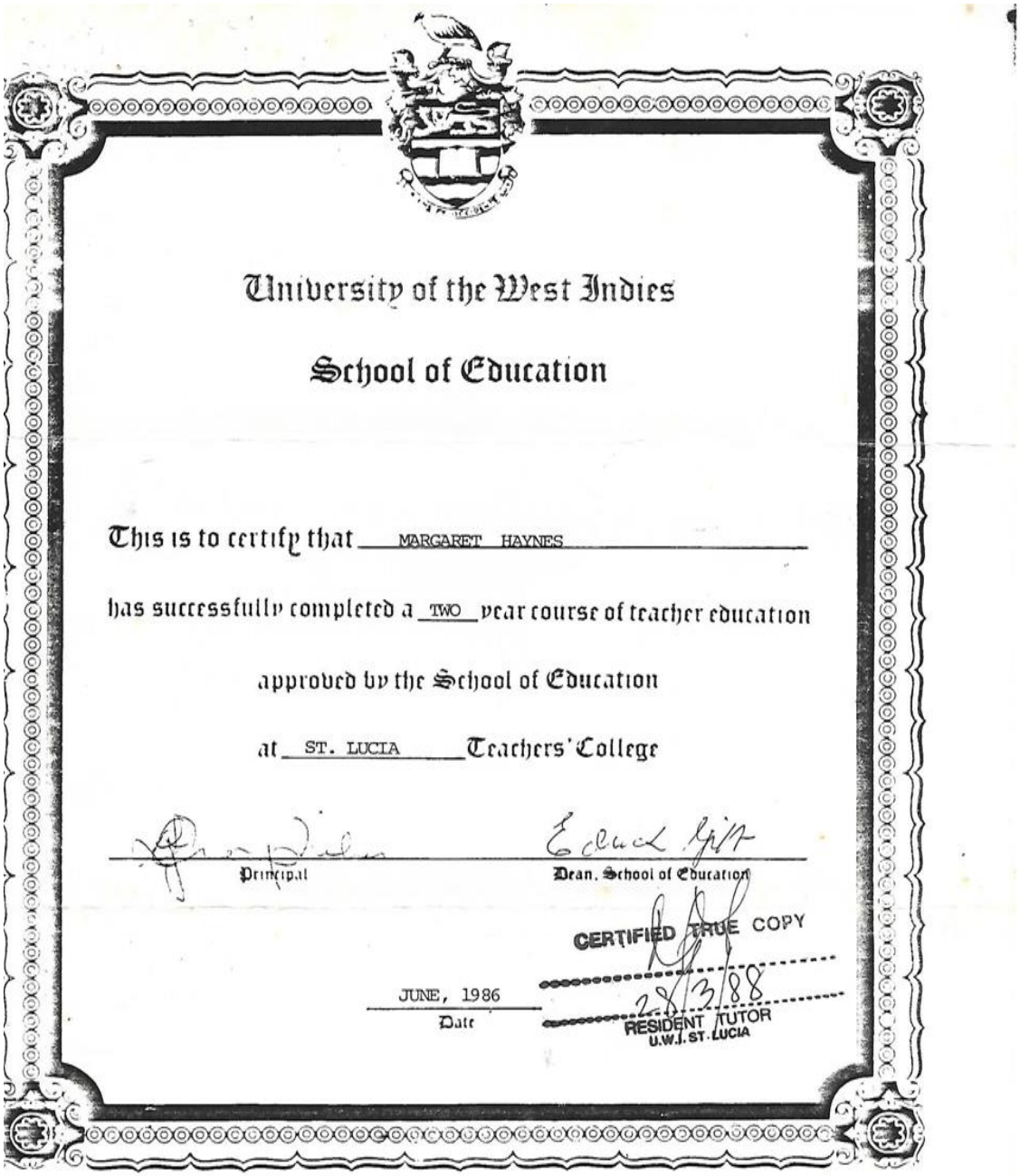
July 1, 1995
DATE

VICE-CHANCELLOR

UNIVERSITY REGISTRAR

This Document is not valid unless it bears the University's seal

Appendix 15: Linguist Credentials (Teacher Education Certificate)



University of the West Indies

School of Education

This is to certify that MARGARET HAYNES

has successfully completed a TWO year course of teacher education

approved by the School of Education

at ST. LUCIA Teachers' College

Principal

Dean, School of Education

CERTIFIED TRUE COPY

JUNE, 1986

Date

28/3/88

RESIDENT TUTOR
U.W.I. ST. LUCIA