

UNIVERSIDAD PARA LA COOPERACIÓN INTERNACIONAL (UCI)

Project Management Plan for the Updating of the FLOW Saint Lucia Radio
Access/Mobile Network to the Long Term Evolution (4G) Technology

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FINAL GRADUATION PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE
MASTER IN PROJECT MANAGEMENT (MPM) DEGREE

Castries, Saint Lucia

September, 2020

APPROVAL PAGE

UNIVERSIDAD PARA LA COOPERACIÓN INTERNACIONAL
(UCI)

This Final Graduation Project was approved by the University as
partial fulfillment of the requirements to opt for the
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DEDICATION

This research project is dedicated to my children, Nathaniel and Monica, for loving Daddy unconditionally and giving him reasons to be a better man.

To my beautiful wife, Paula; my mother, Lucy; and brother, Bernie, thanks for the support.

A special mention to my tutor, Osvaldo Martinez, for his guidance, patience, and understanding.

ACKNOWLEDGMENTS

Clarence Griffith – Director Technology Operations, Central Cluster, Cable and Wireless Communications.

Dr. Jimmy Fletcher – Former Minister for The Public Service, Sustainable Development, Energy, Science and Technology, Saint Lucia.

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ABBREVIATIONS AND ACRONYMS

1G: First generation wireless cellular technology (analog standards)

2G: Second generation cellular network (digital encryption, GSM)

3G: Third generation wireless cellular technology (fast data transfer)

4G: Fourth generation cellular technology (data speeds: 10 times of 3G)

AMPS: Advanced mobile phone systems

CWC: Cable and Wireless Communications

E-commerce: commercial transactions conducted electronically on the Internet

E-government: It refers to "utilization of Information Technology (IT), Information and Communication Technologies (ICT s), and other web-based telecommunication technologies to improve and/or enhance on the efficiency and effectiveness of service delivery in the public sector."

E learning: learning conducted via electronic media, typically on the Internet

GOSL: Government of Saint Lucia

GSM: Global system for mobile communications

HF: High frequency, radio waves between 3 and 30 MHz

HSPA: High speed packet access

ICT: Information and communications technology

LTE: Long term evolution

TDMA: Time division multiple access

VOIP: Voice over Internet protocol

EXECUTIVE SUMMARY

“Telecommunications Project Management – a holistic approach for operations-related services by T. Frisanco, N. Angleberger, R. Ang, and S.Onu,” quotes that the telecommunications industry has undergone a rigorous paradigm shift and value migration from equipment sales towards operations related services, providing long-term, ongoing operations rather than one-time deployment and commissioning. With project complexity and lifetime constantly increasing, the nature of contracting and the vendor-operator partnership changes.

Both companies, CWC and Ericsson have project management offices, neither of which is located within the OECS. The local team, up to this juncture, is utilized only after project completion, and the deliverables were handed over to operations. This is changing, and the local team will be required to participate in the project management processes, e.g. adequate stakeholder consultation, projectized work, etc. This project management plan will enable the understanding and practical application of the various procedures, such as the monitoring and reporting mechanism and timely engagement of stakeholders, whilst increasing the efficiency of the overall Ericsson project management office.

The final graduation project general objective is to develop a project management plan, framed within the standards of the Project Management Institute, to manage the technology update of a radio access network in Saint Lucia. The specific objectives are to create a project charter to formally authorize the project; to create a scope management plan; to create a schedule management plan to support the development and management of the project schedule; to create a cost management plan to define the processes for developing and managing the project budget; to develop a quality management plan to identify the quality requirements for the project; to develop a resource management plan to ensure that all resources are identified and managed effectively; to develop a communication management plan to ensure the timely and effective communication of the project status and other key information; to create a risk management plan to identify and examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks; to develop a procurement management plan to be used to obtain products and/or services necessitated by the project; and to develop a stakeholder management plan to identify, support, and ensure the effective engagement of the project stakeholders.

The methodology for the research was a combination of all four (4) approaches: qualitative, quantitative, analytical, and descriptive methods. A combination of literature review exercises, strategy and process mapping approaches, and various interviews provided for the comprehensive analysis of the existing processes and resources within the Ericsson and CWC project management offices that will be used in the subsequent development of the local project management plan. In instances where collated information was not readily available, datasets were examined and aggregated.

The resulting project management plan spanned the areas of the project that necessitated identification, analysis, moderation, and control to ensure project

completion within schedule and budget while guaranteeing quality and regulatory specifications. Metrics to monitor and control the schedule, quality, performance, and budget were identified, along with the communication procedures and reporting methods to ensure project progress and control variances. The advantage of having documentation of recently performed projects with similar objectives in other business units was integral in grasping what was required for the success of this project. This project management plan documented the time and cost constraints and included the associated risks, opportunities, and related mitigation and management recommendations. Nature, the government policy, societal norms, regulations, and telecom standards were considered in every complementary plan and were orchestrated within the scope requirements, quality monitoring, risk identification, and management processes. This Saint Lucia LTE upgrade project management plan will become part of the local Ericsson project management and operations environment aiming to ameliorate efficiencies by improving the skillset of the local Ericsson staff and identifying local contractors and suppliers of required quality. These benefits allow the local Ericsson team to develop and be active participants in the Ericsson ethos of empowering an intelligent, sustainable, and connected world.

CHAPTER I. INTRODUCTION

1.1. Background

FLOW is a trade name of the Caribbean telecom Cable & Wireless Communications (CWC), used to market cable television, internet, and telephone and wireless services.

“Cable & Wireless’ links to St Lucia go way back to 1871 when the original parent company West India and Panama Telegraph Company landed a submarine cable at Yellow-Sands (Sandals La Toc beach on the island’s northwestern coast), connecting St Lucia to Martinique, Dominica, Guadeloupe, Antigua, St. Kitts, St. Thomas and Puerto Rico. A year later, telecommunications links between St Lucia and the “mother country” England were established. In 1938, the West India and Panama Telegraph Company changed its name to Cable & Wireless (West Indies) Ltd.

During that period, St Lucia’s communications continued to be enhanced with ship-to-shore radio added in 1924, High Frequency (H.F.) radio in 1928, and an inter-island tropospheric radio system in 1965. Cable & Wireless was responsible for providing international communications to the island, while the government provided local telephony. The principle means of international telecommunications was the Telegram, which had progressed from being sent in Morse code, to being typed on a “teleprinter.” St Lucia was also the home base of a series of cable ships used to maintain the submarine cables in the region and beyond.

In 1966, the Government of St Lucia (GOSL) signed a 20-year exclusive agreement with C&W to provide for the installation and maintenance of an island wide automated telephone system. In the ensuing years, the towns and villages were progressively connected to the network. In an effort to further enhance the quality of its service and satisfy the increasingly sophisticated needs of its customers, Cable & Wireless (St Lucia) in the mid 80s introduced 1st generation mobile phone communications to St Lucia based on the American standard TDMA

system. This was done together with other Cable & Wireless business units in the region who also launched their own mobile phone services.

In 2003, the telecommunications sectors in St Lucia and several other islands of the eastern Caribbean were liberalized. Responding to the entry of competitors into the telecom market for the first time and to consumer demands for lower rates and mobile phone technology with greater flexibility and functionality, Cable & Wireless (St Lucia) expanded its network infrastructure to include GSM and GPRS services (2nd Generation/2G)."¹

FLOW St Lucia's single mobile services competitor, Digicel, began operations in 2003 with the launch of the first 2nd generation digital communication network and quickly gained 65% of the customer market share. In July 2013, FLOW upgraded their mobile network to HSPA (UMTS/3G) technology, offering a highly efficient way of browsing the internet and communicating on portable devices using voice over IP (VOIP), email, and instant messaging. Digicel followed with a similar UMTS upgrade in 2014, sparking a marketing campaign by both providers for the population of 180 870 ² containing 105.64 mobile phone subscribers per 100 persons³.

1.2. Statement of the Problem

FLOW or CWC St. Lucia is the largest telecommunications provider on the island. The offered services are mobile, broadband, TV, and landline. The rapid changes in technology require that telecommunication companies acquire PMOs that are staffed with competent individuals to make sure that projects and programs are run in a repeatable, standardized way.

This FGP permits one, among other things, to identify and make the most effective use of resources to capitalize on the expertise of that capability. There has been a prevailing attitude with regard to project management functions that the

¹ The Commonwealth Yearbook 2005, Richard Green

² <https://www.gfdrr.org/sites/default/files/publication/pda-2014-saint-lucia.pdf>

³ https://www.theglobaleconomy.com/Saint-Lucia/Mobile_phone_subscribers_per_100_people/

project managers should also be engineers; most times this strategy leads to an improper utilization of resources.

Kendrick, V.L. (1990) in *The Role of Project Managers in Telecommunications*, *Project Management Journal* states, "One of the most successful concepts of project management incorporates the concept of efficient resource utilization. It allows the project manager to lead a team, which includes engineers and representatives from all the required disciplines. By developing this concept, a telecommunications corporation will employ project managers who can readily transition from one project to the next or handle more than one project at a time. At the same time, the project managers can recruit those engineering services required from the proper engineering discipline – such as outside plant, equipment, or data transmission – as necessary throughout the project. In this manner, the project manager employs his skills at organization, scheduling and management to the fullest extent and only obligates the engineers for the necessary amounts of time to complete the project successfully."

The project management plan intends to view the structures, processes, and various competencies required to enact a telecommunications project and how the various procedures utilized can improve operational and daily tasks within the company.

1.3. Purpose

The intention of this project is to investigate, compare, and evaluate the initiating, planning, executing, monitoring and control, and closing phases of the upgrade of the FLOW mobile network with the knowledge areas and process groups recommended by the Project Management Institute.

Mostafa Hashem Sherif in *Telecommunication Project Management* wrote that project management is the application of knowledge, skills, techniques, and tools to align resources and achieve the objectives of the sponsors within specific constraints of cost, time, and quality. Formal project management techniques have become important in telecommunication services because of four main factors. First, telecommunication services have been unbundled as a consequence of

regulatory and technological changes, as well as increased outsourcing. Thus, many independent entities need to cooperate despite opposing and conflicting agendas. Second, the planning and development of infrastructure projects typically last several years and may involve up to several thousand persons from many suppliers. Third, there are now many forms of telecommunication services, ranging from basic telephony using wireline or wireless access to internet or broadband services. Finally, new services must fit within an environment defined by already existing technical and organizational legacies. Thus, the introduction of new products is typically constrained by diverse factors, such as legislation, standards, embedded customer base, interconnectivity agreements with other operators, etc.

1.4. General Objective

To create a project management plan, framed within the standards of the Project Management Institute, to manage the technology update of a radio access network in Saint Lucia

1.5. Specific Objectives

1. To create a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project and to produce the project management plan
2. To create a scope management plan to ensure that it includes all the work required to successfully complete the project
3. To create a schedule management plan to support the development and management of a project schedule to ensure the project is completed within the allotted timetable
4. To create a cost management plan to define the processes for developing and managing the project budget to ensure the project is completed within the budget constraints
5. To develop a quality management plan to identify the quality requirements for the project in order to ensure results meet expectations for approval within the time, cost, and scope constraints

6. To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within the schedule, budget, and agreed quality
7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information to all the stakeholders
8. To create a risk management plan to identify and examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks
9. To develop a procurement management plan to be used to obtain products and/or services necessitated by the project
10. To develop a stakeholder management plan to identify, support, and ensure the effective engagement of the project stakeholders

CHAPTER II. THEORETICAL FRAMEWORK

2.1. Company/Enterprise Framework

FLOW was the first company to connect the Caribbean people, governments, and businesses with telecom networks across broadband, fixed, and mobile services. The move to a modern 4G network is a key step in improving the capacity and robustness of FLOW's data network. This upgrade should pave the way for continuous improvements in service quality. The new network will be designed to support expected growth in the future. Presently, FLOW's mobile service (2G & 3G) covers 95% of the Saint Lucian population with an active subscriber base of 42 000 where 34 500 are prepaid and 7 500 are postpaid customers.

2.1.1. Company/Enterprise Background

The ITU publications on regional initiatives in the Americas 2019 report "The Economic Contribution of Broadband, Digitization and ICT Regulation – Econometric modelling for The Americas" states that mobile broadband has a higher impact on the world economy than fixed broadband. Furthermore, it is estimated that on average an increase of 10 per cent in mobile broadband penetration yielded an increase in 1.7 per cent in GDP (in the Americas, excluding USA and Canada). Further to that, the economic impact of mobile broadband is higher in countries with lower levels of development: an increase of 10 percent in mobile broadband penetration yields an increase in 2.0 per cent of GDP. It also states that the transformative power of digital technologies and connectivity is empowering people, creating an environment that nurtures innovation and is triggering positive change in business processes and in the global economy [5].

St. Lucia, through the utilization of LTE technology, can drive digital transformation and systematically restructure the society, getting the most out of services like e-commerce, e-learning, and e-government. In 2013, the GOSL embarked on a five-year plan to improve access to information and communications technology with the modernization of the government's operations

and increased ICT access in rural communities. The policy was approved by the Cabinet of Ministers and included mandates to facilitate universal accessibility to information and communications technology. Local telecommunications service providers were encouraged to upgrade their wireless broadband through the provision of government concessions. “The granting of these concessions was part of a deliberate strategy to improve the economic competitiveness of our island and broaden the opportunities available to our citizens for learning and working,” said the minister responsible for sustainable development, energy, science, and technology: Honorable Dr. James Fletcher, at the 3G launch of FLOW’s mobile competitor in 2014.

2.1.2. Mission and Vision Statements

FLOW’s mission statement: To provide world-leading wholesale telecommunications products and services to enable Latin America and the Caribbean to advance and progress. This mission statement places high value on FLOW’s PMO ability to deliver on the objectives of their projects with high quality products and services, within schedule and budget.

FLOW’s vision statement: To provide the most efficient and reliable delivery of services, through the most technologically advanced and extensive broadband network in Latin America and the Caribbean, serving Telco and ISP providers.

2.1.3. Organizational Structure

Cable and Wireless Communications head office is located in Miami, Florida. The business is comprised of four main units and a project management office (PMO). The four business units are:

- CWC Panama
- CWC Northern Cluster: Jamaica, Bahamas, and The Cayman Islands
- CWC Southern Cluster: Trinidad, Barbados, Curacao, and St Marteen
- CWC Central Cluster: St Kitts & Nevis, Montserrat, Dominica, St Vincent, Grenada, St Lucia, Antigua & Barbuda, Anguilla, The Virgin Islands, and Turks and Caicos.

The FGP will be performed within the Saint Lucia unit, which is comprised of Transmission and IP, Commercial & Marketing, Human Resource, and Fleet & Properties departments. The PMO and the head of technology of the CWC Central Cluster play integral roles in all stages of the project.

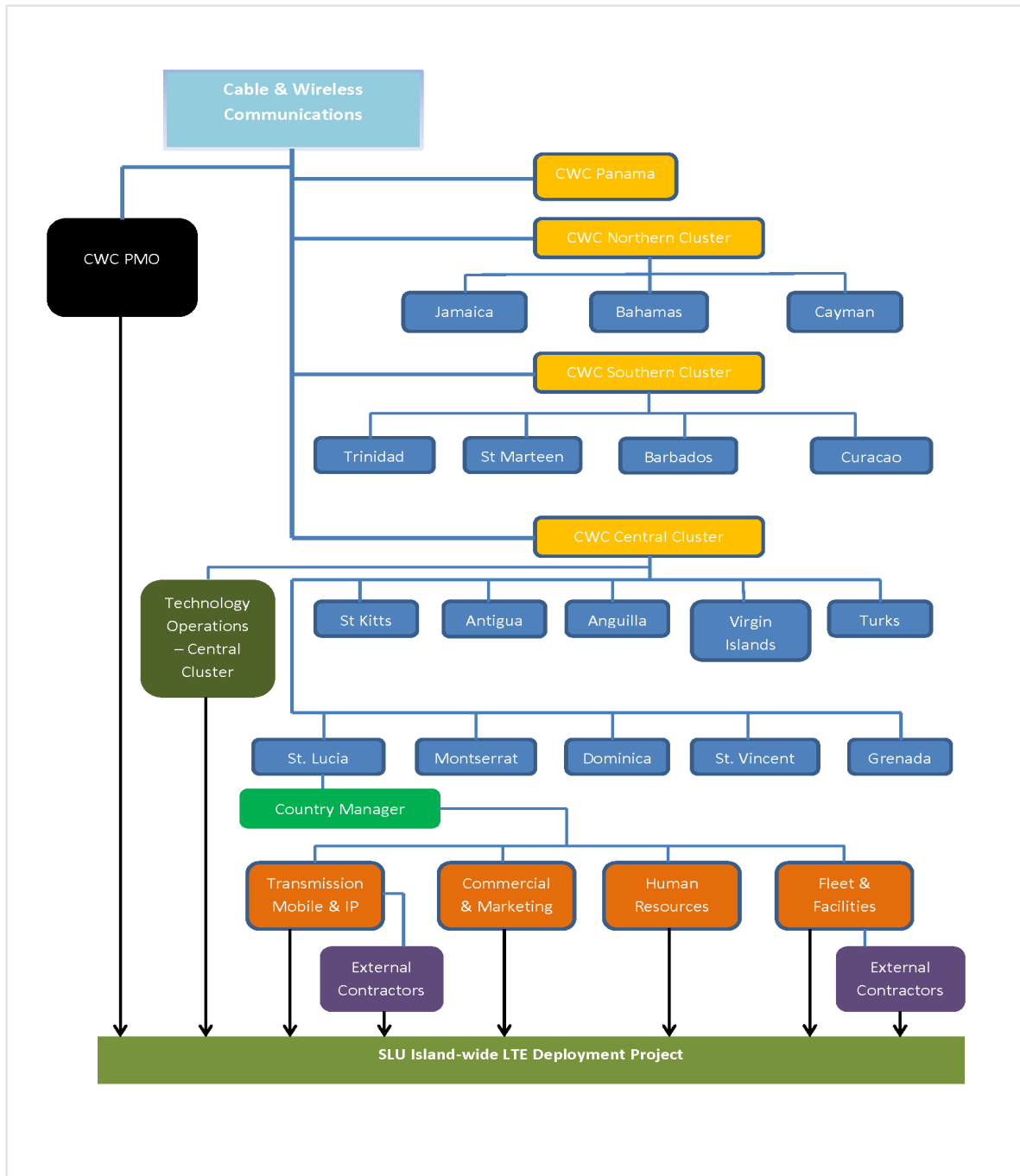


Figure 1. Organizational Structure

2.1.4. Products Offered

The main product considered for this project is that of wireless broadband or LTE service. FLOW already has the technology in four districts; however, due to customer demand, loss of market share, the offering of a similar service island-wide by the only competitor, and pressure from the government, FLOW is about to provide the service throughout the island and improve their wireless services in areas where they were previously non-existent. FLOW Saint Lucia also offers fixed broadband, HDTV, and fixed-line service

2.2. Project Management Concepts

2.2.1. Project

According to A Guide to the Project Management Book of Knowledge (PMBOK) Sixth Edition, a project is a temporary endeavor undertaken to create a unique product, service, or result. Projects are undertaken to fulfill objectives by producing deliverables. An objective is defined as an outcome toward which work is to be directed, a strategic position to be attained, a purpose to be achieved, a result to be obtained, a product to be produced, or a service to be performed. A deliverable is defined as any unique and verifiable product, result, or capability to perform a service that is required to complete a process, phase, or project.

This project has as its main objective to create a project management plan for the update of the FLOW Saint Lucia existing radio access network from 2G/3G to 2G/3G/4G and install 4 new sites of 3G/4G technology. I work with the firm that has to operate and maintain that network after the project is complete, so this FGP grants me an opportunity to learn “hands on.”

2.2.2. Project Management

According to A Guide to the Project Management Book of Knowledge (PMBOK) Sixth Edition, project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project management is accomplished through the appropriate application and integration of the project management processes identified for the project.

This FGP will allow me to be the project manager of my project, deliver a project management plan, and work with those who are managing the project to update the radio access network.

2.2.3. Project Life Cycle

According to the PMBOK (Sixth Edi.), a project life cycle is the series of phases that a project passes through from its start to its completion. It provides the basic framework for managing the project. The basic framework applies regardless of the specific project work involved. The phases may be sequential, iterative, or overlapping.

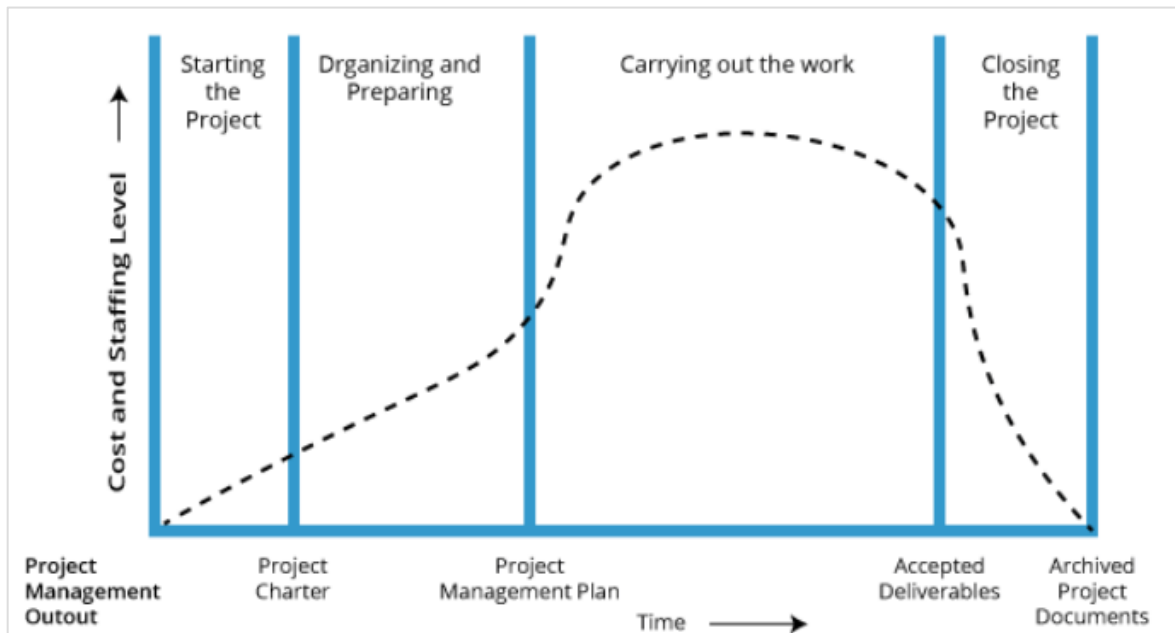


Figure 2. Project Life Cycle and Main Characteristics

Source: <https://vnenergy.com/what-is-project-life-cycle-and-its-main-characteristics/>

The four stages of the project life cycle commonly used by the CWC are the following:

1. Initiation stage – At the start of each financial year, several meetings are held at the senior level between the heads of Commercial & Marketing and Finance units. Various project proposals are presented and discussed; subsequently, recommendations are approved, and resource

capacity is finalized. Business units are then informed of what projects will be provisioned.

2. Planning stage – The projects are handed over to the PMO. There, they are fragmented into resource, hardware, software, and procurement requisites. The relevant stakeholders are contacted, and further dialogues are held.
3. Execution stage – Legal agreements are signed. Procurement processes begin. Resources are relocated. Special communication methodologies are utilized, and deliverables are worked on.
4. Closure stage – Once the objectives are delivered and/or the monies are exhausted, the project is closed.

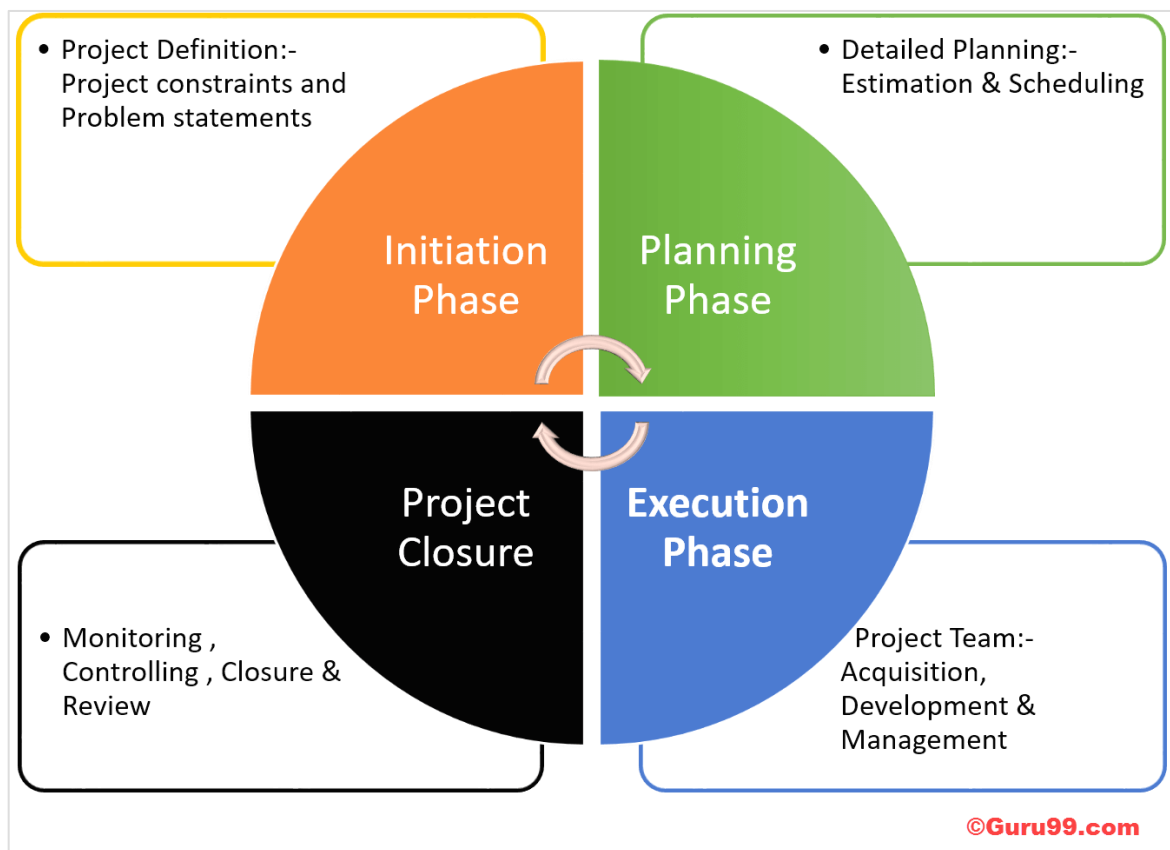


Figure 3. Phases of CWC Project Management Life Cycle

2.2.4. Project Management Processes

According to the PMBOK (6th Edition), Project management processes are described as a systematic series of activities directed toward causing an end result where on one or more inputs will be acted upon to create one or more outputs.

Project management processes are logically linked by the outputs they produce. Processes may contain overlapping activities that occur throughout the project. The output of one process generally results in either:

- An input to another process or
- A deliverable of the project or project phase

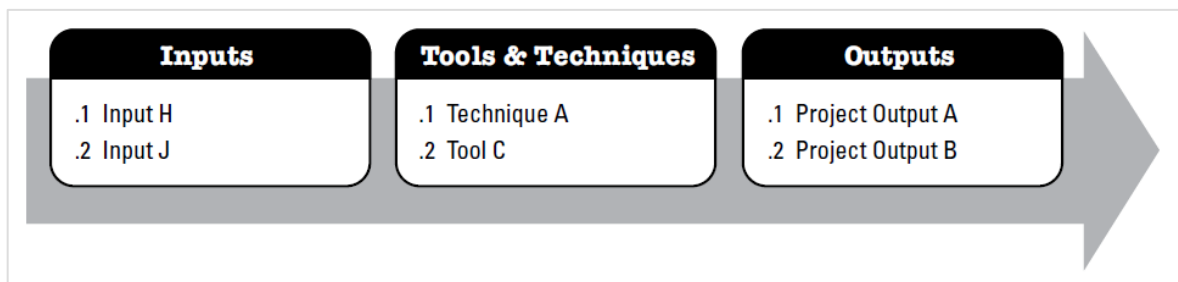


Figure 4. Example Process - Inputs, Tools & Techniques, and Outputs

Project management process groups are defined as a logical grouping of project management processes to achieve specific project objectives. Process groups are independent of project phases. Project management processes are grouped into the following five project management process groups:

- Initiating process group: Those 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: Those processes required to establish the scope of the project, define the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve
- Executing process group: Those processes performed to complete the work defined in the project management plan to satisfy the project requirements

- Monitoring and controlling process group: Those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes
- Closing process group: Those processes performed to formally complete or close the project, phase, or contract

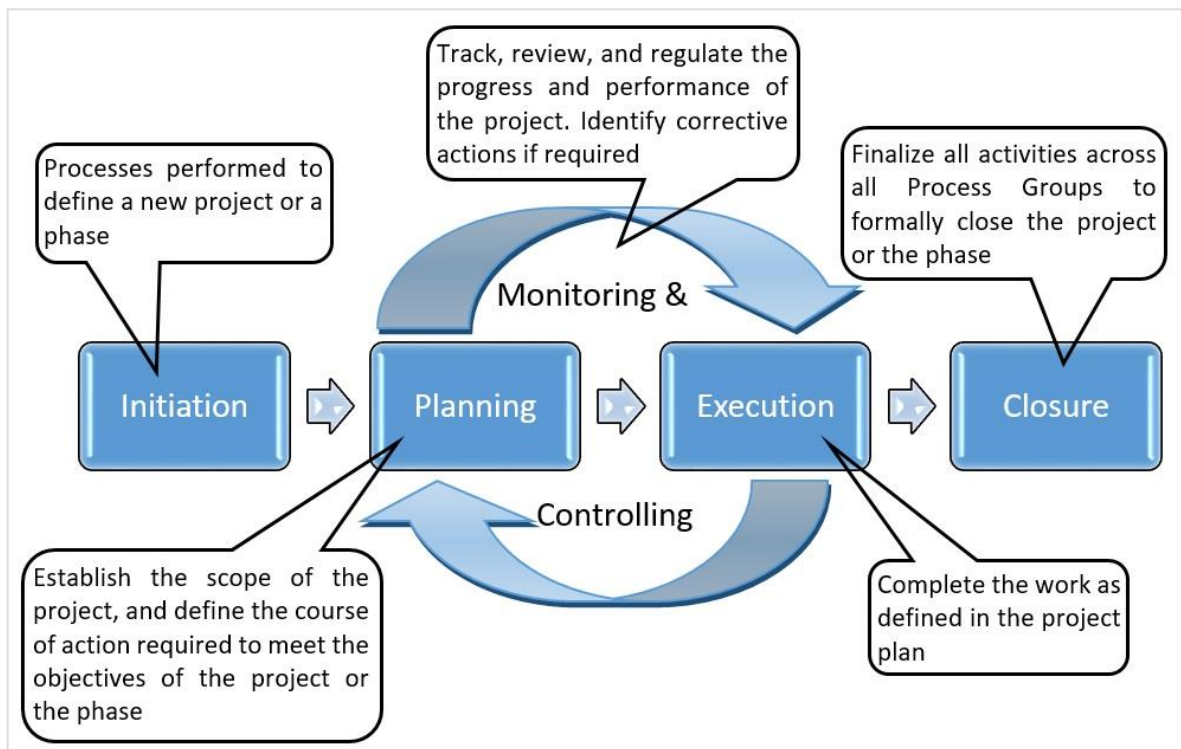


Figure 5. Project Management Process Groups

Source: <https://www.pmwares.com/blog/project-management-process-groups/>

2.2.5. Project Management Knowledge Areas

PMBOK defines a knowledge area as 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.

Although the knowledge areas are interrelated, they are defined separately from the project management perspective. The ten knowledge areas described in this guide are the following:

- Project integration management: It includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the project management process groups.
- Project scope management: It includes the processes required to ensure the project includes all the work required, and only the work required, to complete the project successfully.
- Project schedule management: It includes the processes required to manage the timely completion of the project.
- Project cost management: It includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so the project can be completed within the approved budget.
- Project quality management: It includes the processes for incorporating the organization's quality policy regarding planning, managing, and controlling project and product quality requirements in order to meet stakeholders' expectations.
- Project resource management: It includes the processes to identify, acquire, and manage the resources needed for the successful completion of the project.
- Project communication management: It includes the processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and ultimate disposition of project information.
- Project risk management: It includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.
- Project procurement management: It includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team.

- Project stakeholder management: It includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project; to analyze stakeholder expectations and their impact on the project; and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Figure 6. Project Management Process Group and Knowledge Area Mapping
Source: PMBOK Guide 6th Edition.

2.3. Technology

2.3.1. Long Term Evolution

LTE stands for Long Term Evolution, and it was started as a project in 2004 by a telecommunication body known as the Third Generation Partnership Project

(3GPP). SAE (System Architecture Evolution) is the corresponding evolution of the GPRS/3G packet core network evolution. The term LTE is typically used to represent both LTE and SAE.

LTE evolved from an earlier 3GPP system known as the Universal Mobile Telecommunication System (UMTS), which in turn evolved from the Global System for Mobile Communications (GSM). Even related specifications were formally known as the evolved UMTS terrestrial radio access (E-UTRA) and evolved UMTS terrestrial radio access network (E-UTRAN). The first version of LTE was documented in Release 8 of the 3GPP specifications.

A rapid increase of mobile data usage and the emergence of new applications, such as MMOG (multimedia online gaming), mobile TV, Web 2.0, and streaming contents, have motivated the 3rd Generation Partnership Project (3GPP) to work on the Long-Term Evolution (LTE) on the way towards fourth-generation mobiles.

The main goal of LTE is to provide a high data rate, low latency, and packet optimized radio access technology supporting flexible bandwidth deployments. The network architecture has been designed with the goal to support packet-switched traffic with seamless mobility and great quality of service.

The advantages of LTE include the following:

- High throughput: High data rate can be achieved in both downlink as well as uplink; this causes high throughput.
- Low latency: The time required to connect to the network is in range of a few hundred milliseconds, and power saving states can now be entered and exited very quickly.
- Superior end-user experience: It is the optimized signaling for connection establishment and other air interface and mobility management procedures that have further improved the user experience.
- The user does not have to manually install drivers for the device. Instead, the system automatically recognizes the device, loads new

drivers for the hardware if needed, and begins to work with the newly connected device.⁴

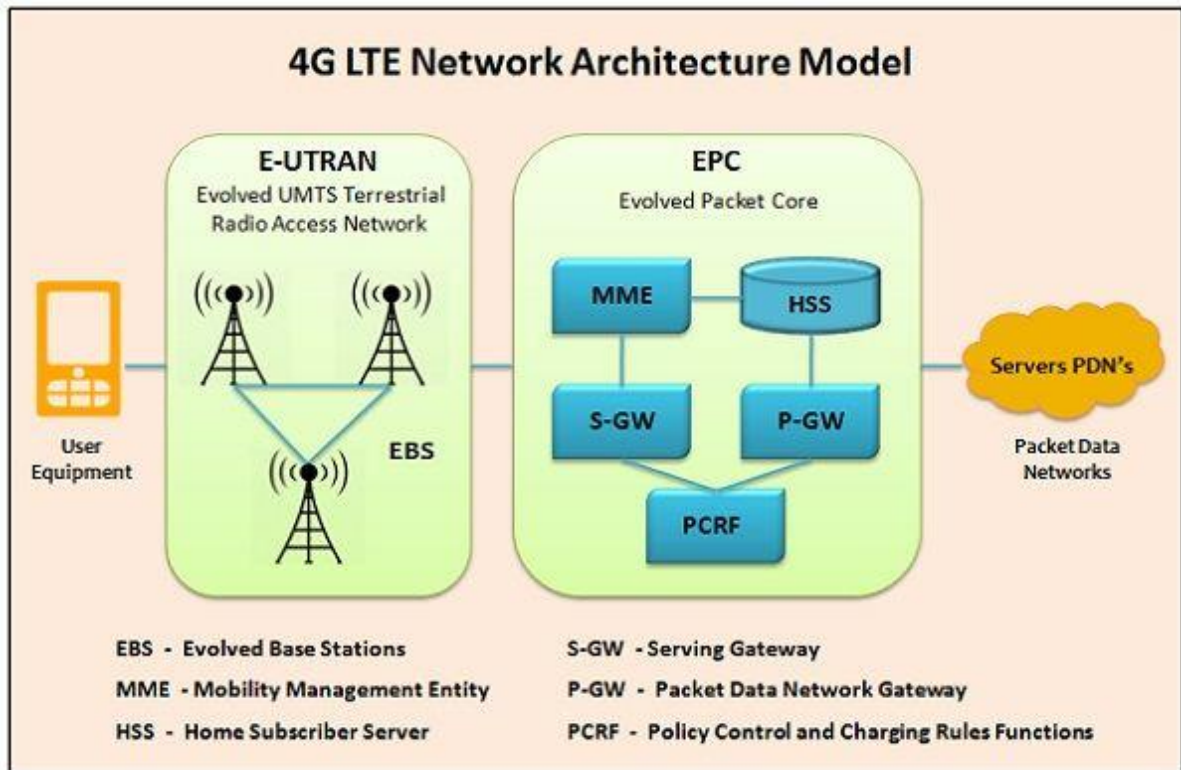


Figure 7. 4G LTE Network Architecture Model

Source: <https://techdifferences.com/difference-between-3g-and-4g-technology.html>

⁴ LTE Overview – Tutorialspoint: https://www.tutorialspoint.com/lte/lte_overview.htm

2.3.2. Present Coverage Status

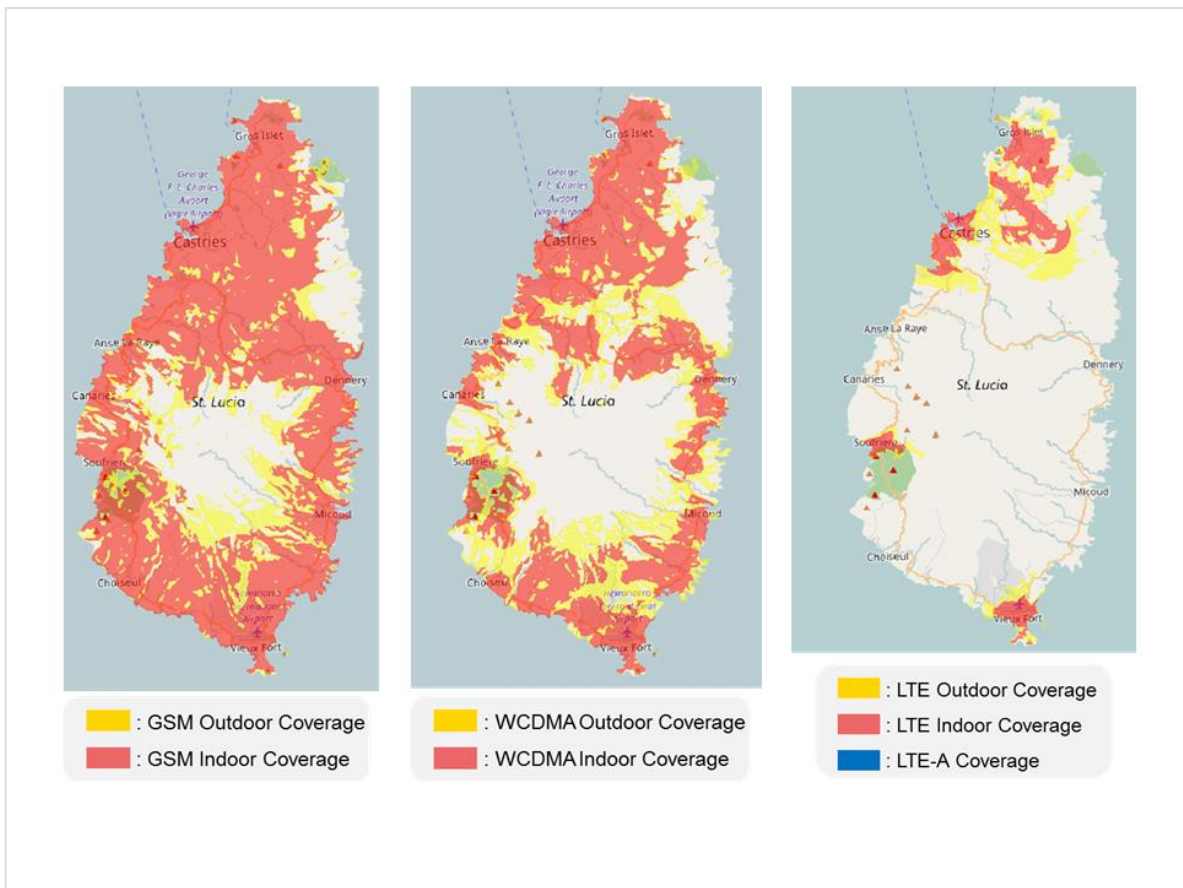


Figure 8. Present 2/3/4G FLOW Mobile Coverage.

CHAPTER III. METHODOLOGICAL FRAMEWORK

3.1. Information Sources

Information sources 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. Information sources can be observations, people, speeches, documents, pictures, and organizations. Information sources can be in print, non-print, and electronic media or format.⁵

3.1.1. Primary Sources

Primary sources provide first-hand testimony or direct evidence concerning a topic under investigation. They are created by witnesses or recorders who experienced the events or conditions being documented. Often, these sources are created at the time when the events or conditions are occurring, but primary sources can also include autobiographies, memoirs, and oral histories recorded later.⁶

Some of the primary sources used in the FGP are interviews with staff of CWC that are directly involved in CWC project related activities, survey data, photographs, and network statistics.

3.1.2. Secondary Sources

Secondary sources are one step removed from primary sources, though they often quote or otherwise use primary sources. They can cover the same topic, but they add a layer of interpretation and analysis⁷.

Some of the secondary sources used in the FGP are books, pages, online data and analysis, articles, and data analysis.

⁵ http://karibouconnections.luminosacreative.com/wordpress/medlibafrica/training_module/

⁶ <https://www.slideshare.net/joh5700/what-are-information-sources-23796587>

⁷ <https://umb.libguides.com/PrimarySources/secondary>

Chart 1. Information Sources

Objectives	Information sources	
	Primary	Secondary
To create a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project and to produce the project management plan	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories; official and unofficial records of CWC, GOSL, and other telecom companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To create a scope management plan to ensure that it includes all the work required to successfully complete the project	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC, GOSL, and other telecom companies , and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To create a schedule management plan to support the development and management of a project schedule to ensure the project is completed within the allotted timetable	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC, GOSL, and other telecom companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To create a cost management plan to define the processes for developing and managing the project budget to ensure the project is completed within the budget constraints	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC, GOSL, and other telecom companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises

Objectives	Information sources	
To develop a quality management plan to identify the quality requirements for the project in order to ensure results meet expectations for approval within the time, cost, and scope constraints	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC and GOSL companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within the schedule, budget, and agreed quality	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC and GOSL companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To develop a communication management plan to ensure the timely and effective communication of the project status and other key information	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC and GOSL companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To create a risk management plan to identify and examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC and GOSL companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To develop a procurement management plan to be used to	Interviews, observation, internet communication	Previous research, letters, government reports, online

Objectives	Information sources	
obtain products and/or services necessitated by the project	through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC and GOSL companies, and technical reports	information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises
To develop a stakeholder management plan to identify, support and ensure the effective engagement of the project stakeholders.	Interviews, observation, internet communication through email, WhatsApp, and Skype messaging, photographs, books, magazines, newspaper articles, speeches and oral histories, official and unofficial records of CWC and GOSL companies, and technical reports	Previous research, letters, government reports, online information, historical data, information and analysis, reference books, magazine articles, journals, review articles, indexes, abstracts, newspaper articles after the event, textbooks, and treatises

3.2. Research Methods

Research methods are the strategies, processes, or techniques utilized in the collection of data or evidence for analysis in order to uncover new information or create better understanding of a topic.

3.2.1. Analytical Method

In analytical research, the researcher has to use facts or information already available and analyze them to make a critical evaluation of the material⁸.

3.2.2. Descriptive Method

Descriptive research includes surveys and fact-finding enquiries of different kinds. The major purpose of descriptive research is the description of the state of affairs as it exists at present.⁹

⁸ https://shodhganga.inflibnet.ac.in/bitstream/10603/73387/13/13_%20chapter%204.pdf

⁹ https://shodhganga.inflibnet.ac.in/bitstream/10603/73387/13/13_%20chapter%204.pdf

3.2.3. Quantitative Method

Quantitative research gathers numerical data that can be ranked, measured, or categorized through statistical analysis. It assists with uncovering patterns or relationships and making generalizations. This type of research is useful for finding out how many, how much, how often, and to what extent.¹⁰

3.2.4. Qualitative Method

Qualitative research gathers data about lived experiences, emotions or behaviors, and the meanings individuals attach to them. It assists in enabling researchers to gain a better understanding of complex concepts, social interactions, or cultural phenomena¹¹.

Chart 2. Research Methods

Objectives	Research methods			
	Quantitative	Qualitative	Analytical	Descriptive
To create a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project and to produce the project management plan	This sampling method analyses statistical records to describe variables that determine proceedings between casual project charter factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the project charter. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the project charter.	This method provides an in-depth explanation of the project charter as it presently exists.

¹⁰ <https://libguides.newcastle.edu.au/researchmethods>

¹¹ <https://libguides.newcastle.edu.au/researchmethods>

Objectives	Research methods			
To create a scope management plan to ensure that it includes all the work required to successfully complete the project	This sampling method analyses statistical records to describe variables that determine proceedings between casual scope management factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the scope management plan. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the scope management plan.	This method provides an in-depth explanation of the scope management plan as it presently exists.
To create a schedule management plan to support the development and management of a project schedule to ensure the project is completed within the allotted timetable	This sampling method analyses statistical records to describe variables that determine proceedings between casual schedule management factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the schedule management plan. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the schedule management plan.	This method provides an in-depth explanation of the schedule management plan as it presently exists.
To create a cost management plan to define the processes for developing and managing the project budget to ensure the project is completed within the budget constraints	This sampling method analyses statistical records to describe variables that determine proceedings between casual cost management factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the cost management plan. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the cost management plan.	This method provides an in-depth explanation of the cost management plan as it presently exists.
To develop a	This sampling	This method is	This method	This method

Objectives	Research methods			
quality management plan to identify the quality requirements for the project in order to ensure results meet expectations for approval within the time, cost, and scope constraints	method analyses statistical records to describe variables that determine proceedings between quality management factors and to facilitate the best projections of future outcomes in this knowledge area.	a basis for research into how and why decisions are made with regard to the quality management plan. It delves into key components of this knowledge area.	facilitates the collation of information relevant to CWC to evaluate the formation of the quality management plan.	provides an in-depth explanation of the quality management plan as it presently exists.
To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within the schedule, budget, and agreed quality.	This sampling method analyses statistical records to describe variables that determine proceedings between resource management factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the resource management plan. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the resource management plan.	This method provides an in-depth explanation of the resource management plan as it presently exists.
To develop a communication management plan to ensure the timely and effective communication of the project status and other key information	This sampling method analyses statistical records to describe variables that determine proceedings between communication management factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the communication management plan. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the communication management plan.	This method provides an in-depth explanation of the communication management plan as it presently exists.
To create a risk management plan to identify and	This sampling method analyses statistical records	This method is a basis for research into	This method facilitates the collation	This method provides an in-depth

Objectives	Research methods			
examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks	to describe variables that determine proceedings between risk management factors and to facilitate the best projections of future outcomes in this knowledge area.	how and why decisions are made with regard to the risk management plan. It delves into key components of this knowledge area.	of information relevant to CWC to evaluate the formation of the risk management plan.	explanation of the risk management plan as it presently exists.
To develop a procurement management plan to be used to obtain products and/or services necessitated by the project	This sampling method analyses statistical records to describe variables that determine proceedings between procurement management factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the procurement management plan. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the procurement management plan.	This method provides an in-depth explanation of the procurement management plan as it presently exists.
To develop a stakeholder management plan to identify, support, and ensure the effective engagement of the project stakeholders.	This sampling method analyses statistical records to describe variables that determine proceedings between stakeholder management factors and to facilitate the best projections of future outcomes in this knowledge area.	This method is a basis for research into how and why decisions are made with regard to the scope management plan. It delves into key components of this knowledge area.	This method facilitates the collation of information relevant to CWC to evaluate the formation of the stakeholder management plan.	This method provides an in-depth explanation of the stakeholder management plan as it presently exists.

3.3. Tools

The Merriam-Webster Dictionary defines a tool as something (such as an instrument or apparatus) used in performing an operation or necessary in the practice of a vocation or profession.

Some of the tools used in this FGP are expert judgment, data gathering, interpersonal and team skills, and meetings.

Chart 3. Tools

Objectives	Tools & techniques
1. To create a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project and to produce the project management plan	Expert judgment, data gathering (brainstorming, focus groups, interviews), interpersonal and team skills (conflict management, facilitation, meeting management), and meetings
2. To create a scope management plan to ensure that it includes all the work required to successfully complete the project	1. Plan scope management: expert judgment, data analysis, and meetings 2. Collect requirements: expert judgment, data gathering, data analysis, decision making, data representation, interpersonal and team skills, context diagram, and prototypes 3. Define scope: expert judgment, data analysis, decision making, interpersonal and team skills, and product analysis 4. Create WBS: expert judgment and decomposition 5. Validate scope: inspection and decision making 6. Control scope: data analysis
3. To create a schedule management plan to support the development and management of a project schedule to ensure the project is completed within the allotted timetable	1. Plan schedule management: expert judgment, data analysis, and meetings 2. Define activities: expert judgment, decomposition, rolling wave planning, and meetings 3. Sequence activities: precedence diagramming method, dependency determination and integration, leads and lags, and project management information system 4. Estimate activity durations: expert judgment, analogous estimating, parametric estimating, three point estimating, bottom-up estimating, data analysis, and decision making meetings 5. Develop schedule: schedule network analysis, critical path method, resource optimization, data analysis, leads and lags, schedule compression, project management information system, and agile release planning 6. Control schedule: data analysis, critical path method, project management information system, resource optimization, leads and lags, and schedule compression
4. To create a cost	1. Plan cost management: expert judgment, data analysis, and

Objectives	Tools & techniques
management plan to define the processes for developing and managing the project budget to ensure the project is completed within the budget constraints	<p>meetings</p> <p>2. Estimate costs: expert judgment, analogous estimating, parametric estimating, bottom-up estimating, three-point estimating, data analysis, project management information system, and decision making</p> <p>3. Determine budget: expert judgment, cost aggregation, data analysis, historical information review, funding limit reconciliation, and financing</p> <p>4. Control costs: expert judgment, data analysis, to-complete performance index, and project management information system</p>
5. To develop a quality management plan to identify the quality requirements for the project in order to ensure results meet expectations for approval within the time, cost, and scope constraints	<p>1. Plan quality management: expert judgment, data gathering, data analysis, decision making, data representation, test and inspection planning, and meetings</p> <p>2. Manage quality: data gathering, data analysis, decision making, data representation, audits, design for X, problem solving, and quality improvement methods</p> <p>3. Control quality: data gathering, data analysis, inspection, testing/product evaluations, data representation, and meetings</p>
6. To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within the schedule, budget, and agreed quality	<p>1. Plan resource management: expert judgment, data representation, organizational theory, and meetings</p> <p>2. Estimate activity resources: expert judgment, bottom-up estimating, analogous estimating, parametric estimating, data analysis, project management information system, and meetings</p> <p>3. Acquire resources: decision making, interpersonal and team skills, pre-assignment, and virtual teams</p> <p>4. Develop team: colocation, virtual teams, communication technology, interpersonal and team skills, recognition and rewards, training, individual and team assessments, and meetings</p> <p>5. Manage team: interpersonal and team skills and project management information system</p> <p>6. Control resources: data analysis, problem solving, interpersonal and team skills, and project management information system</p>
7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information	<p>1. Plan communication management: expert judgment, communication requirement analysis, communication technology, communication models, communication methods, interpersonal and team skills, data representation, and meetings</p> <p>2. Manage communication: communication technology, communication methods, communication skills, project management information system, project reporting, interpersonal and team skills, and meetings</p> <p>3. Monitor communication: expert judgment, project management information system, data representation, interpersonal and team skills, and meetings</p>
8. To create a risk management	1. Plan risk management: expert judgment, data analysis, and

Objectives	Tools & techniques
plan to identify and examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks	meetings 2. Identify risks: expert judgment, data gathering, data analysis, interpersonal and team skills, prompt lists, and meetings 3. Perform qualitative risk analysis: expert judgment, data gathering, data analysis, interpersonal and team skills, risk categorization, data representation, and meetings 4. Perform quantitative risk analysis: expert judgment, data gathering, interpersonal and team skills, representations of uncertainty, and data analysis 5. Plan risk responses: expert judgment, data gathering, interpersonal and team skills, strategies for threats, strategies for opportunities, contingent response strategies, strategies for overall project risk, data analysis, and decision making 6. Implement risk responses: expert judgment, interpersonal and team skills, and project management information system 7. Monitor risks: work performance information, change requests, project document updates, and organizational process asset updates
9. To develop a procurement management plan to be used to obtain products and/or services necessitated by the project	1. Plan procurement management: expert judgment, data gathering, data analysis, source selection analysis, and meetings 2. Conduct procurements: expert judgment, advertising, bidder conferences, data analysis, and interpersonal and team skills 3. Control procurements: expert judgment, claims administration, data analysis, inspection, and audits
10. To develop a stakeholder management plan to identify, support, and ensure the effective engagement of the project stakeholders	1. Identify stakeholders: expert judgment, data gathering, data analysis, data representation, and meetings 2. Plan stakeholder engagement: expert judgment, data gathering, data analysis, decision making, data representation, and meetings 3. Manage stakeholder engagement: Expert judgment, communication skills, interpersonal and team skills, ground rules, and meetings 4. Monitor stakeholder engagement: Data analysis, decision making, data representation, communication skills, interpersonal and team skills, and meetings

Source: PMBOK Guide 6th Edition

3.4. Assumptions and Constraints

According to PMBOK Guide 5th Edition, a project assumption is “a factor in planning process that is considered to be true, real or certain often without any proof or demonstration.” Another definition could be the following: “Project Assumptions are events or circumstances that are expected to occur during the project life-cycle”.

A constraint, in project management, is any restriction that defines a project’s limitations.

Chart 4. Assumptions and Constraints

Objectives	Assumptions	Constraints
1. To create a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project and to produce the project management plan	It is assumed that CWC will approve the proposal.	The availability of funding or capital expenditure
2. To create a scope management plan to ensure that it includes all the work required to successfully complete the project	It is assumed that the stakeholders and work to be accomplished will be adequately catered for in this plan.	There is significant prep work to be done before this project begins.
3. To create a schedule management plan to support the development and management of a project schedule to ensure the project is completed within the time constraints	It is assumed that budget and stakeholders will deliver the project objectives on time.	The inclemency of the weather on the island may interfere with the project.
4. To create a cost management plan to define the processes for developing and managing the project budget to ensure the project is completed within the budget constraints	The budget approved will be adequate to complete the objectives of the project.	New banking regulations may affect the ease with which monies are transferred to the islands.
5. To develop a quality management plan to identify the quality requirements for the project in order to ensure results meet expectations for approval within the time, cost, and scope constraints	It is assumed that the final product will be to the satisfaction of CWC.	Qualified contractors have to be flown in from other countries.
6. To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within the schedule, budget, and agreed quality.	It is assumed that the resource management plan will adequately cover the hardware and skilled labor required.	Saint Lucia's foreign policy is considering implementing visa and time restrictions on Venezuela – where most of the skilled contractors will be from.
7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information	It is assumed that the communication plan will be sufficient for all stakeholders.	Some of the stakeholders are non-English speakers.
8. To create a risk management plan to identify and examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks	It is assumed that the project will run smoothly.	All eventualities cannot be accounted for.
9. To develop a procurement management plan to be used to obtain products and/or services necessitated by the project	It is assumed that all items required will be procured and available when needed.	The availability of raw material may affect the delivery of certain hardware.
10. To develop a stakeholder management plan to identify, support, and ensure the effective engagement of the project stakeholders	It is assumed that all stakeholders will assist to make the project successful.	A few of the software installers are in various time zones, therefore complicating meeting times.

3.5. Deliverables

According to the Project Management Guide, a deliverable is an element of output within the scope of a project. There can be one or several deliverables within a single project. It may also be described as a tangible or intangible product or service produced because of the project that is intended to be delivered to a customer.¹²

Objectives	Deliverables
1. To create a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project and to produce the project management plan	Project charter
2. To create a scope management plan to ensure that it includes all the work required to successfully complete the project	Scope management plan
3. To create a schedule management plan to support the development and management of a project schedule to ensure the project is completed within the time constraints	Schedule management plan
4. To create a cost management plan to define the processes for developing and managing the project budget to ensure the project is completed within the budget constraints	Cost management plan
5. To develop a quality management plan to identify the quality requirements for the project in order to ensure results meet expectations for approval within the time, cost, and scope constraints	Quality management plan
6. To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within the schedule, budget, and agreed quality	Resource management plan
7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information	Communication management plan
8. To create a risk management plan to identify and examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks	Risk management plan
9. To develop a procurement management plan to be used to obtain products and/or services necessitated by the project	Procurement management plan
10. To develop a stakeholder management plan to identify, support, and ensure the effective engagement of the project stakeholders	Stakeholder management plan

Chart 5. Deliverables

¹² <https://www.arraspeople.co.uk/camel-blog/project-management/project-management-101-objectives-and-deliverables/>

CHAPTER IV. RESULT ANALYSIS

4.1. Project Integration Management

4.1.1. Introduction

There is purpose in preparing this project management plan (PMP) for the updating of the FLOW Saint Lucia radio access/mobile network to the Long Term Evolution technology. This PMP aids the author in understanding and identifying the involved processes, how the project phases are communicated and measured, and most importantly, how a successful conclusion to the project is achieved. A Guide to the Project Management Body of Knowledge, PMBOK® Guide 6th Edition, states that the project management plan is the document that describes how the project will be executed, monitored and controlled, and closed. It integrates and consolidates all the subsidiary management plans, baselines, and other information necessary to manage the project. The obligations of the project determine which components of the project management plan are necessary.

4.1.2. Create Project Management Plan

The creation of the project management plan involves defining, preparing, and coordinating all plan components and consolidating them into an integrated project management process (PMBOK®, 2017).

4.1.3. Direct and Manage Project Work

Direct and manage project work is the process of leading and performing the work defined in the project management plan and additionally, resolving any issues that may arise and implementing approved changes to achieve the project's objective.

4.1.4. Manage Project Knowledge

Managing project knowledge is the strategic management of people with associated content and information in an organization, using technology and processes to optimize knowledge sharing to achieve the project's objectives and contribute to organizational learning. The lessons learned documentation is

knowledge gained throughout the project and recorded using tools, such as a lessons learned template. The purpose of the lessons learned is to improve performance. The lessons will be reviewed and added to the Ericsson projects' database. Recording learnt lessons is an ongoing process throughout the entire project life cycle.

4.1.5. Monitor and Control Project Work

The execution of the LTE upgrade project is to be monitored and controlled. The project manager will collect appropriate data, record it, and distribute the information in status reports to be communicated as established in the project management plan.

4.1.6. Perform Integrated Change Control

Project change control ensures that no unauthorized alterations are made to a product, service, or process and that approved modifications are made to the requisite specifications. All plans complementing the LTE upgrade project management plan incorporate the change control management process to avoid unnecessary adjustments and to document, evaluate, and agree on change implementation, as needed throughout the project life cycle.

4.1.7. Close Project or Phase

The post project review is a summary and comparison of the original scope of the project and the actual results. A review will be performed every time a phase gate is reached and the project moves from one phase to the next. The post project review is focused on baselines, customer satisfaction, and the organization's critical success factors and opportunities. The post project review process is to be managed by the project manager at the end of the project.

4.1.8. Develop Project Management Plan

Develop project management plan is the process of defining, preparing, and coordinating all subsidiary plans and integrating them into a comprehensive project

management plan. The key benefit of this process is a central document that defines the basis of all project work.

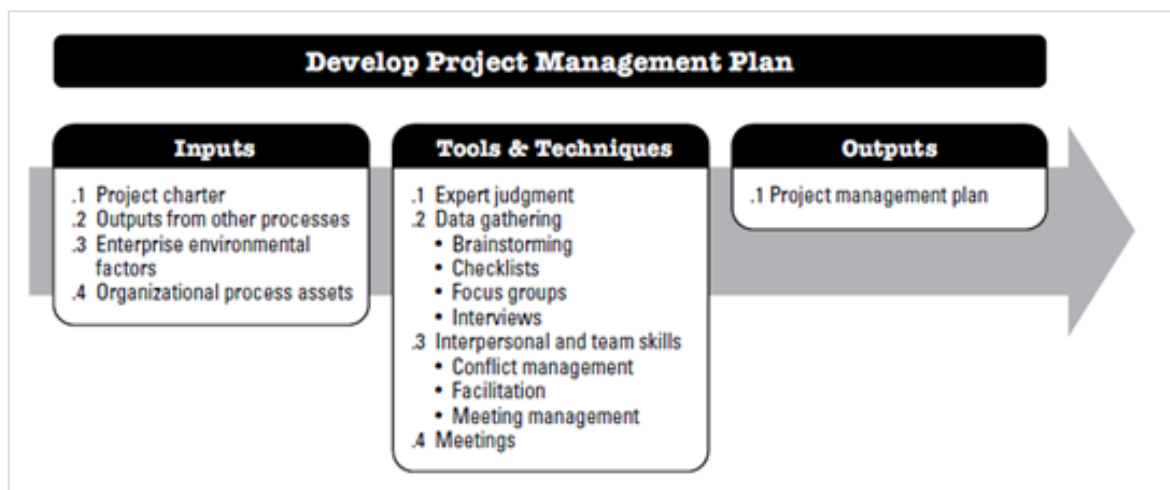


Figure 9. Develop Project Management Plan: Input, Tools & Techniques, and Outputs

4.1.8.1. Enterprise Environmental Factors

Enterprise environmental factors in project management are the factors that originate from outside of the project or organization, for example: culture, weather conditions, the government situation, market conditions, etc., which are usually out of one's control.

4.1.8.1.1. Government Situation

During the period of 2010 to 2015, the governments of the Caribbean states were intent on finding diverse ways to improve the economic and social development of the region. The rapid expansion of information and communication technology sectors (ICT) in different world regions merited that ICT be looked as a viable avenue to enable improvements in the financial wellbeing and general welfare of the region's citizens. The governments of the region embarked on enacting mandates and legislations that were deemed necessary to encourage, stimulate, and support investments in ICTs. Sections of the new mandates enunciated to the mobile service providers that improvements in the coverage and quality of service were crucial and that they were expected of operators within the region. In Saint Lucia, the government enacted The Telecommunications

(Exemption) Order, Statutory Instrument, No 59, in 2014, which exempted certain networks of services from the requirement of obtaining individual licenses, class licenses, or frequency authorization under the Telecommunications Act. See Appendix 4.

4.1.8.1.2. Weather Conditions

The official rainy season is between the months of June and November, but September and October are when more intense weather activity is most likely; therefore, special consideration has to be given to outdoor project work.

4.1.8.1.3. International Affairs

The political situation in Venezuela is worrisome; threats of political upheaval have resulted in millions fleeing the South American nation. This upheaval has caused concern for the Government of Saint Lucia, leading to sudden implementations of visa requirements on Venezuelan nationals entering the island. The field contractors for the project installation were selected from Venezuela-based companies. The project team, at this late stage, now has to consider training local resources in case they are unable to get the full Venezuelan compliment.(see appendix 4)

4.1.8.1.4. Market Conditions

In 2016, C&W wanted to maintain its role as the dominant mobile service provider on the island of Saint Lucia. The sole competitor had deployed additional mobile sites and had an aggressive and relentless public relations campaign, threatening that dominance. High level discussions, held at the time, between the CEO, the marketing director, the operations lead, and other executives highlighted the need for additional capacity, not only for voice traffic but also for the increasing numbers of data subscribers, especially during sporting and entertainment events. Moreover, with the explosion of smart phones and the increasing use of social media (Twitter, Facebook, Instagram, Whatsapp, Youtube), C&W needed to ensure that its customers always have the best mobile experience regardless of where they are on island.

4.1.8.2. Organizational Process Assets

In consideration of network improvements and upgrades in the territories that it operates, Cable and Wireless contemplates and organizes holistically; that is, C&W aims to improve its entire network throughout the region - see Figure 10. In 2016, C&W proposed plans for improvements to its mobile network considering the following objectives: to grow mobile revenue/data via LTE mobile introduction and expansion and improve the overall mobile quality of service. C&W's mobile competitor was poised to make significant gains in the market if C&W did not improve its service.

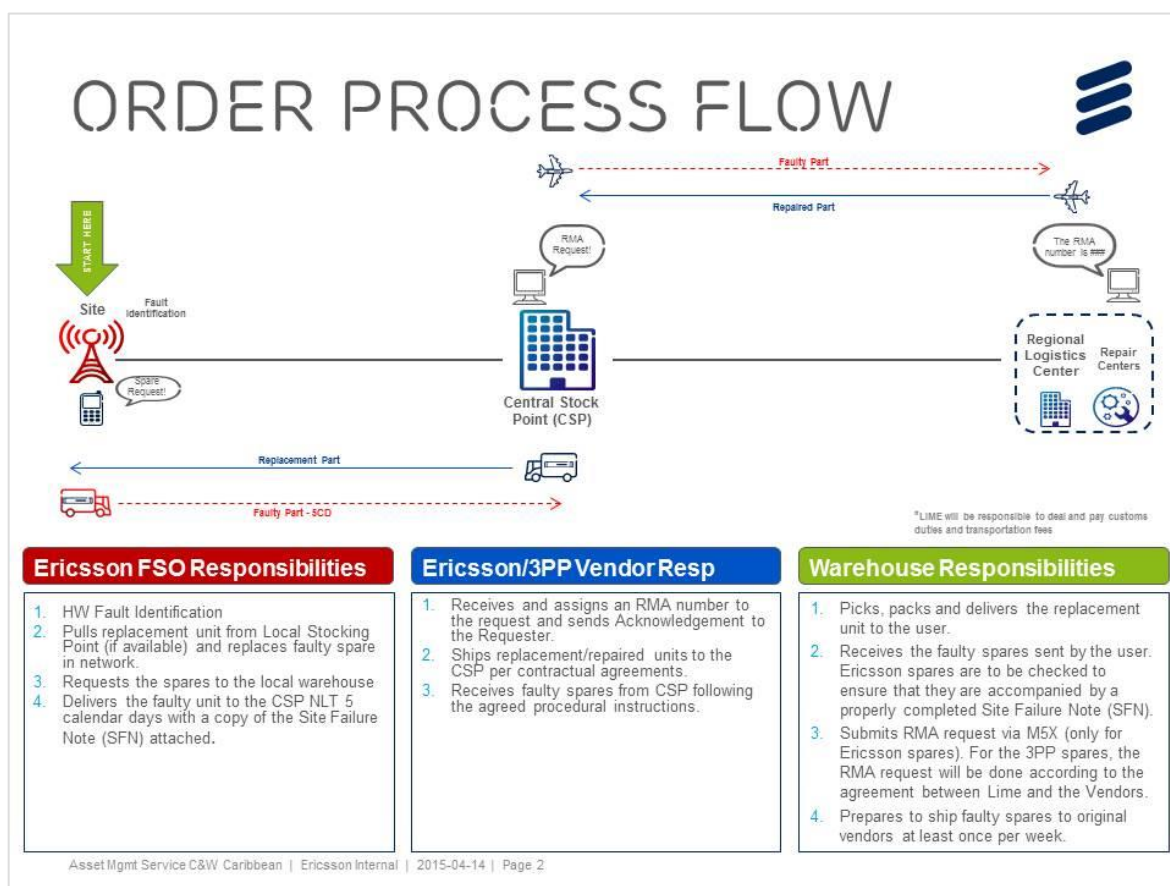


Figure 10. Example of FLOW/Ericsson Process Asset – Hardware Acquisition

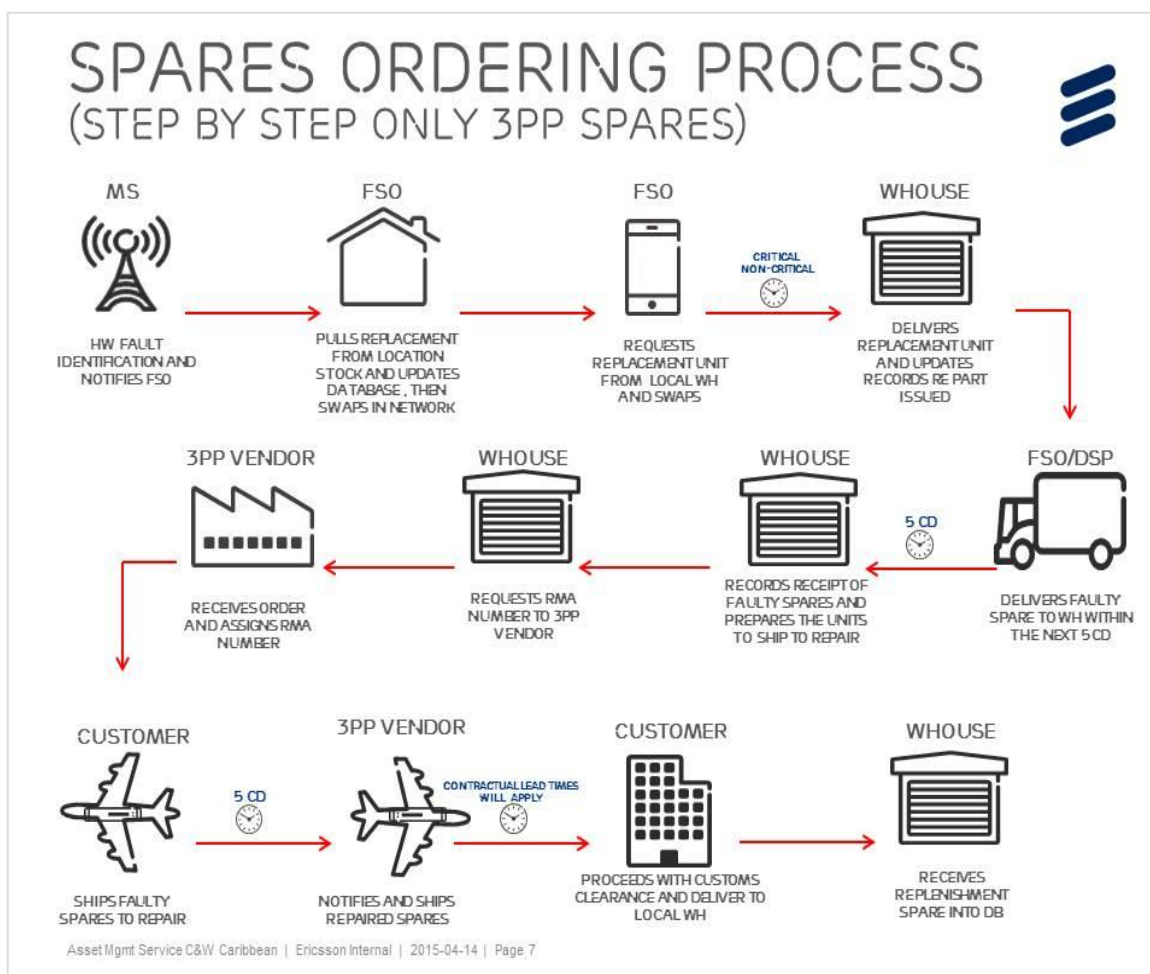


Figure 11. Example of FLOW/Ericsson Process Asset – Faulty Equipment Replacement

C&W officially collaborated with Ericsson in 2016 for Ericsson to supply and install IP networks and upgrade the existing IP backbone network to improve performance and support an increase in traffic. Ericsson would be the main supplier of hardware, resources, technical expertise, and after market operations and maintenance on C&W's mobile networks. As such, Ericsson would be the lead on the LTE installation projects: assessing the present network, designing the new network, procuring the hardware, enlisting of the consultants and field teams, performing the installations, network testing, then operations, and maintenance. The diagrams below represent C&W/Ericsson processes to order equipment/hardware.

4.1.9. Develop the Project Charter

The Project Management Institute's "A Guide to the Project Management Body of Knowledge – PMBOK GUIDE® Sixth Edition" states that the project charter may be referred to as a document issued by the project initiator or sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities. The aforementioned can be compressed into the following; the project charter provides the high-level project description, product characteristics, and approval requirements. The advantages of utilizing the project charter include creating a formal record of the project, providing a direct link between the strategic objectives of the organization and the project, and revealing the organization's commitment to the project.

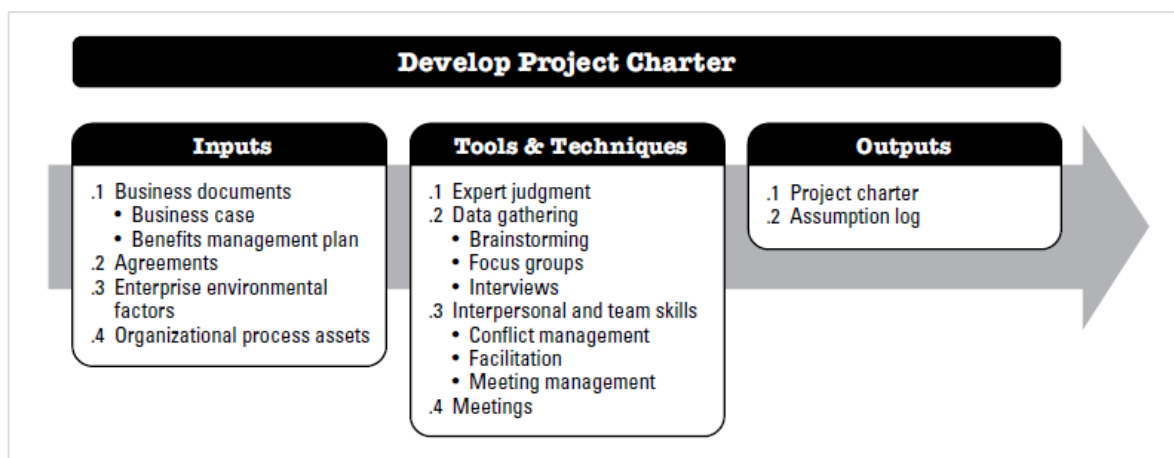


Figure 12. Develop Project Charter, Tools and Techniques

4.1.9.1. Business Documents

The documents are available from various participants of the project: the project manager, the director technology operations, and the general manager. The key documents used to plan the way forward were a business case technical paper and the mobile expansion business case. Ericsson prohibits the use of the documents in their entirety.

4.1.9.2. The Business Case

The business case technical paper is a detailed, documented feasibility study into the requirements of the network that establishes the validity of the improvement proposals in the LTE project. The technical paper outlines the information from the standpoint of C&W as to why the project is a worthwhile investment. It examines the main network activities at present and what upgrades are necessary.

The mobile expansion business case expounds on the financial returns of the proposed expansion with the use of the net present value, the payback period (3 years), and the internal rate of return (IRR). The project's return on investment capital (ROIC) is calculated as well as its contribution to EBITDA – earnings before interest, taxes, depreciation, and amortization.

Type	Activities
3G Capacity	3G RAN Capacity expansions focused on already congested sites as first priority
	3G expansions in Jamaica up to 4th Carrier
	3G Expansions in Antigua, Barbados, BVI, St. Lucia, St. Vincent and TCI
	BSC and RNC expansions in Jamaica, Cayman and Barbados
3G Coverage	Indoor coverage on selected locations like BVI hospital and St. Vincent new airport
	New Co-Locations on Digicel towers for Jamaica
Baseline	EoL/EoS platforms replacements: Switches and routers from MPBN
	Software upgrades to keep the network updated
	Optimization services for RAN 3G, 2G and LTE
	Tower refurbishments
	Benchmark tools
Core Capacity	Additional HSS licenses
LTE Capacity	Carrier expansions in Antigua and Barbados
LTE Coverage	Co-Located sites in Jamaica, Antigua
	LTE Expansion in Saint Lucia
Enabler	Charging system integration with core network elements

Figure 13. Part of the Business Case Technical - Regional Plans

Capital Requested:	Total Capex	18/19 Capex					
		\$1.9M					
Financial Returns	Payback Period:	3 years					
	Net Present Value:	1.5M					
	IRR:	44%					
	Financial Year:	2018/9	2019/20	2020/21	2021/22	2022/23	Total
	Contribution EBITDA	255	455	491	515	539	2,254
	Contribution Cashflow (M)	-1.6	0.89	0.98	0.87	0.6	1.74
ROIC (with this investment)	12%	11%	8%	6%	2%		

Figure 14. Part of the Business Case - LTE Expansion Financials

4.1.9.3. Agreements

As it was mentioned previously, Cable & Wireless Communications (CWC) extended its partnership with Ericsson for the deployment of 4G LTE technology, 3G network transformation, and the latest Ericsson software with advanced smartphone features. This included the use of Ericsson's technology to power CWC's high-performing networks and support the continued delivery of superior-quality user experiences to over 6 million consumers throughout 42 countries.

Under the agreement, Ericsson delivers equipment and a range of professional services, including project management, systems integration, and support. It also includes software updates that deliver new capabilities in radio access, network management, and network control.

4.1.9.4. The Project Charter

After various meetings, the project charter was agreed upon the following:

Chart 6. The Project Charter

1. SUMMARY	
Project name	Saint Lucia LTE Deployment
Executive sponsor	Alexander French
Project manager or lead	Sean Lewis
Project start – end dates	2019/09/02 – 2019/12/20
Project purpose	To upgrade the local mobile network to LTE
Budget /Resources	1.5M
Approved date	2018/3/14
Approving body	
2. SCOPE	
Purpose: To provide enhanced network coverage and improve customer experience, which will help	

reduce churn and result in incremental growth in mobile revenue and overall market share. To create an environment for growth and development within the ICT sector

Background: C&W needs to continue to expand its customer base and enhance its customer experience. Our latest mobile net promoter score, while showing improvement since April 2016, indicates that customers still have network issues, and this was compounded at major events where customers were experiencing some network congestion and frustration using our mobile services.

Inclusion/exclusion criteria: The upgrade of 65 of the present sites to LTE technology, build, and commission of 5 new sites. The key supplier for this will be Ericsson, who will supply the hardware and software upgrades. This project will be focused only on mobile network improvements.

3. BENEFITS

- The proposed design will provide mobile data coverage to some pockets that required additional coverage or where there is limited or no coverage today.
- To increase capacity and coverage at major sporting & entertainment events with the upgraded technology where the existing mobile network cannot handle the capacity
- To drive market share recovery in mobiles services and enhance brand value
- To drive new revenues from existing mobile handset customers (mobile data browsing)
- To drive new revenues from attracting customers to migrate from the competitor

4. PERFORMANCE METRICS

Indicator	Baseline	Benchmark	Target	Rationale
New customer acquisition	-1%	+5%	+3%	To defend the existing base and drive new growth and increased market share
Mobile data packages and revenue as part of total mobile revenue	40%	75%	60%	To increase the number of subscribers with mobile data packages and mobile data
Market share	48%	55%	51%	To increase the mobile market share by 2021

5. MILESTONES & DELIVERABLES

Deliverables	Main tasks	Start	End	Lead
Information collection	Collated information regarding the needs of each site	9/10/2019	9/10/2019	
Receipt of PO	Getting the final lists of equipment & hardware required for the project	9/20/2019	9/20/2019	

Available material	The equipment has been ordered and cleared from customs and is locally available for use.	10/25/2019	10/25/2019	
LTE Sites are in public mode	LTE network officially launched to the public	12/19/19	12/19/19	
Final acceptance	The product is accepted as complete and within acceptable quality and sustainability standards.	1/14/2020	1/14/2020	

6. POTENTIAL ISSUES & RISKS

Issue / Risk	Description	Probability (H, M, L)	Impact (H, M, L)
Inclement weather	The project starts in the peak of the rainy season.	H	L
Hurricanes	Hurricane activity is at its pinnacle during the months of September and October.	L	H
Political upheaval in Venezuela	Most of the contracted staff to do the installation are from Venezuela; the political upheaval may negatively affect relations between Venezuela and Saint Lucia	M	M

7. PROJECT BUDGET/ RESOURCES

Identify the funds and resources required to carry out the project.

2017 - 2018 Capex allocation

8. PROJECT TEAM

Role	Name	Business area
Chair	Jayden Clark	CWC projects
Member	Aimee Saldana Madera	Ericsson field implementation lead
Member	Maico Tovar Rivas	CWC core network lead
Project manager or lead	Sean Lewis	PMO
Resource	Bartelemy Negrere Galindo	Ericsson core network lead

9. AUTHORIZATION

Approved by project sponsor: Alexander French	Date:
Approved by project manager: Sean Lewis	Date:

4.1.10. The Assumption Log

The assumption log is a document that the project manager and team use to capture, document, and track assumptions throughout a project's lifecycle. An assumption log template was included as a reference below:

Chart 7. Assumption Log

Project Name		Date:				
Project Number		Document Number				
Project Manager		Project Owner/Client				
Assumption Number	Date Identified	Assumption	Validation Assigned To	Validation Due Date	Assumption Valid? Y/N	Status/Comments

4.2. The Scope Management Plan

The scope management plan is an integral part of the project management plan that defines how the scope will be defined, developed, monitored, controlled, and verified. It provides guidance and direction on how the scope will be managed throughout the project.

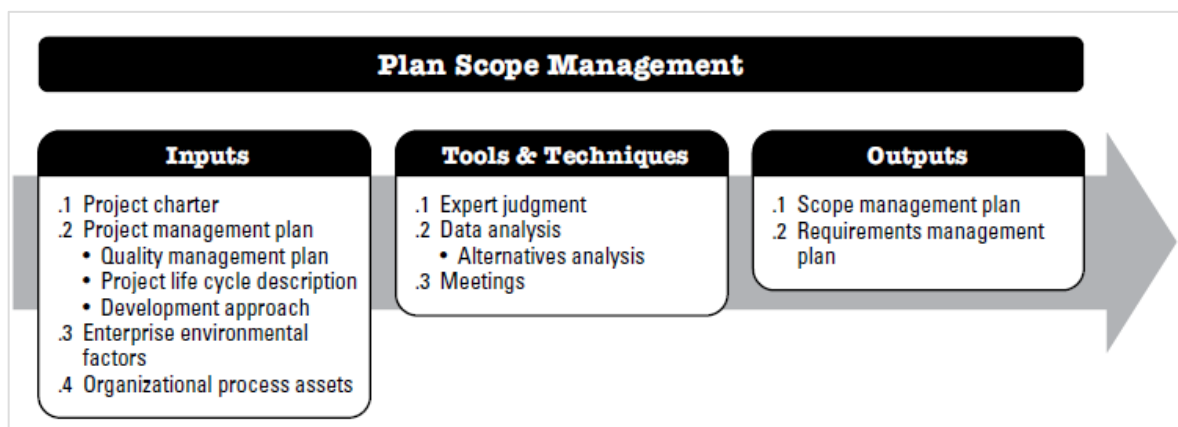


Figure 15. Plan Scope Management: Inputs, Tools & Techniques, and Outputs

PMBOK® Sixth Edition states that the development of the scope management plan and the detailing of the project scope begin with the analysis of the information contained in the project charter, the latest approved subsidiary

plans of the project management plan, historical information contained in the organizational process assets, and any other relevant enterprise environmental factors.

4.2.1. Definition of Scope

This LTE project will be the C&W's first LTE deployment on the island; however, the competition has had their LTE network for the past 6 months and have bombarded the airwaves with ads promoting their network. C&W is eager to have the technology operational and island wide before the New Year celebrations. The scope for this project was defined through meetings with experts in similar projects completed in other Caribbean islands and Ericsson specialists in telecom and IP networks. Data analysis of similar projects and project and network scope elaboration were given significant consideration. A previous project performed a thorough examination of each site to acknowledge what was present and what was required to upgrade the site to LTE. One example is shown in Appendix 5.

4.2.2. Roles and Responsibilities

The various roles in managing the scope of the project are handled by the project manager, sponsor, and project team. To guarantee that the project scope is enacted alongside the established protocols, the roles and responsibilities are to be defined and communicated. Chart 8 identifies key stakeholders, their roles, and responsibilities.

Chart 8. Roles and Responsibilities of the Scope Management

Name	Role	Responsibility
Alexander French	Project sponsor	<ul style="list-style-type: none"> • Approves the scope management plan • Provides high-level scope definition • Reviews escalated scope issues and provides direction for resolution • Approves major scope change requests
Sean Lewis	Project manager	<ul style="list-style-type: none"> • Has overall responsibility for scope management • Oversees the development of the scope management plan • Oversees the scope change management process

Name	Role	Responsibility
		<ul style="list-style-type: none"> • Approves scope change requests within his authority • Escalates scope and change issues • Ensures that scope changes are incorporated into appropriate project documents
Fabio Gallego and Raquel Hernandez	Procurement and contract managers	<ul style="list-style-type: none"> • Ensure that the ordered equipment and foreign contractors are accounted for
Jayden Clark, Facundo Prieto, Felix Johnson, Yolando Bravo, Jake Barrett, and Probo Leon	Project team Subject matter experts	<ul style="list-style-type: none"> • Help develop the project scope • Submit scope change requests • Review scope change requests when assigned • Provide required feedback • Participate in daily/weekly scope reviews

4.2.3. Create Work Breakdown Structure

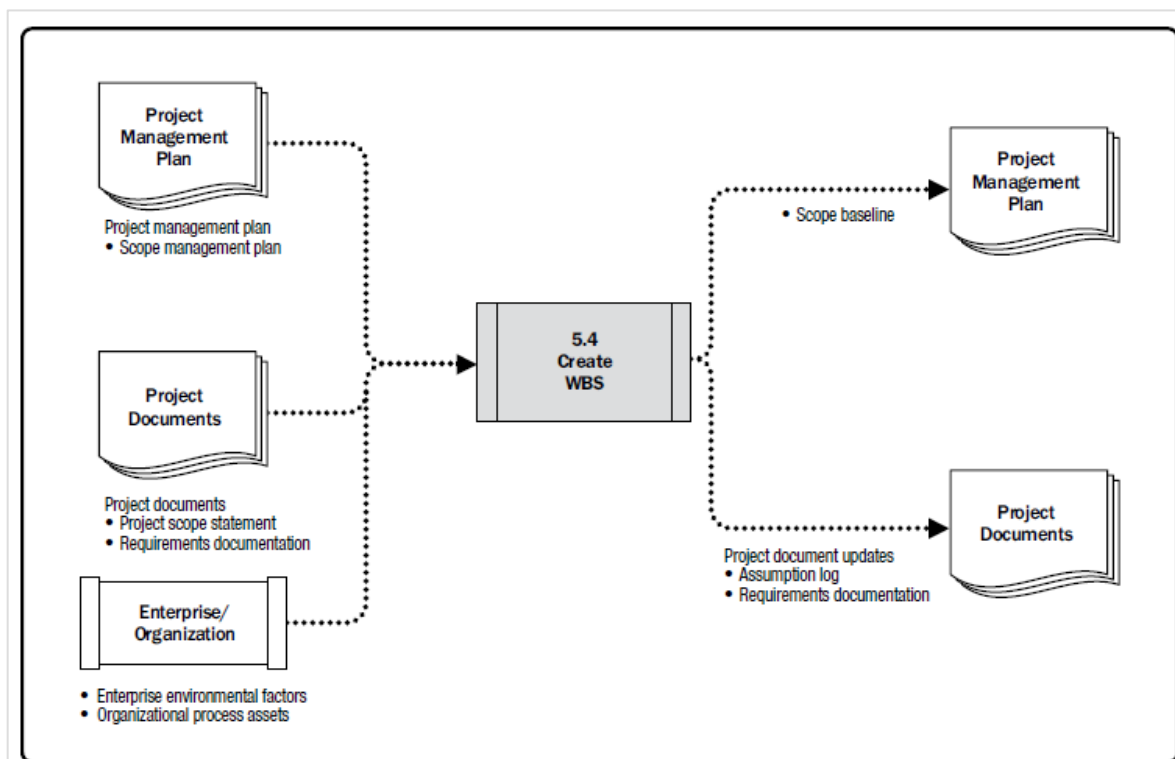


Figure 16. Work Breakdown Structure Process

4.2.4. The Work Breakdown Structure

The work breakdown structure (WBS) in project management is considered a deliverable-oriented breakdown of a project into smaller components. The application of the WBS into the LTE deployment project is crucial, as it reduces complicated activities into a collection of easier-to-oversee tasks. These tasks are measurable and independent, with clearly defined limits.

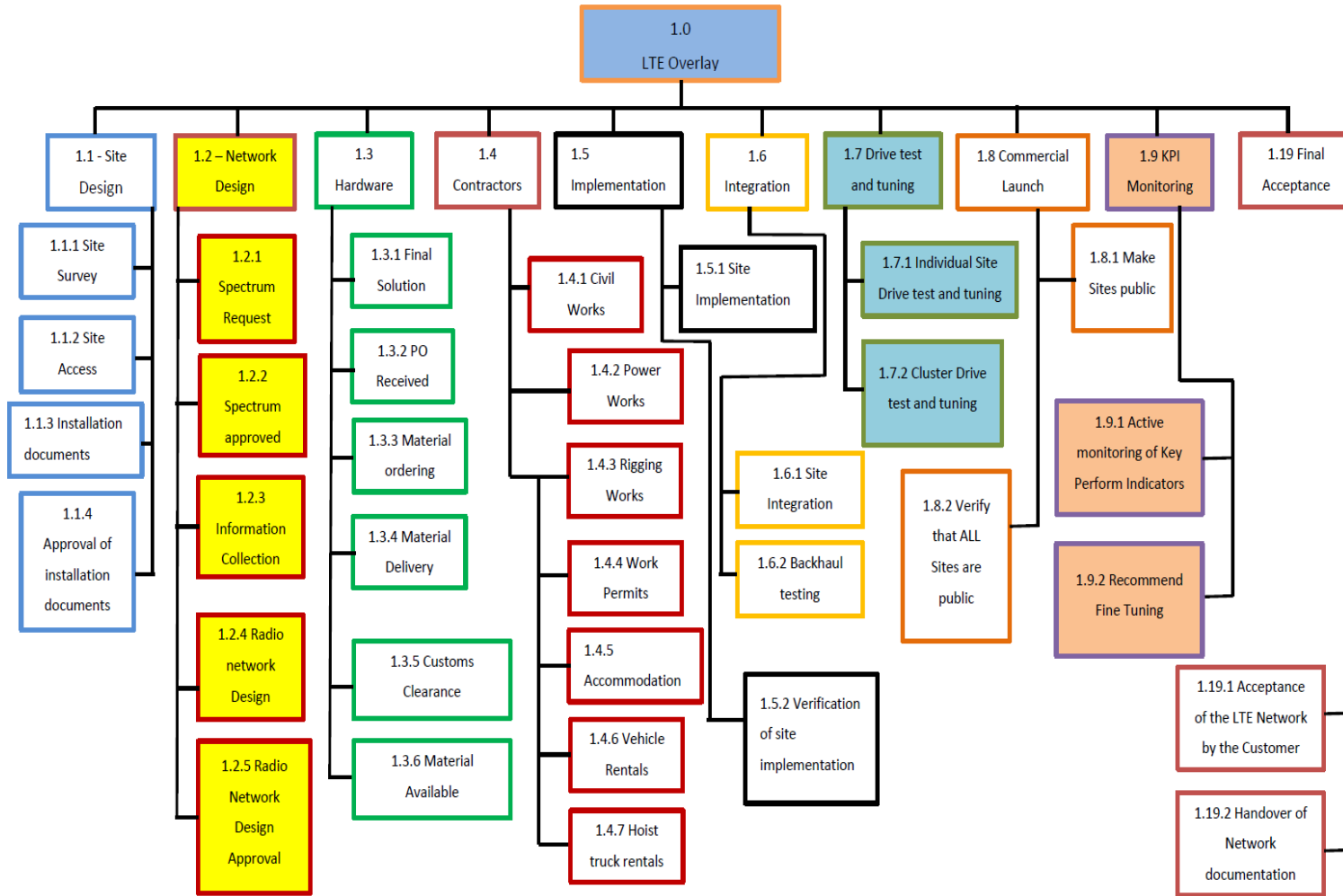


Figure 17. The Work Breakdown Structure

4.2.5. The Work Breakdown Structure Dictionary

The PMBOK Guide 6th Edition states that the WBS dictionary is a document that provides detailed deliverable, activity, and scheduling information about each component of the WBS. The WBS dictionary is a document that supports the WBS.

Chart 9. The Work Breakdown Structure Dictionary

WBS level	WBS code	WBS name	WBS description
1	1	LTE overlay	Definition of processes and procedures to implement LTE technology
2	1.1	Site design	Collocate all necessary info on sites as is; then, plan requirements.
2	1.2	Network design	Plan IT details and assign IP ranges, network backhaul, and RF allocation per site/sector.
2	1.3	Hardware	Identify, source, and purchase all HW required for the project.
2	1.4	Contractors	Identify the necessary contractors to perform the required tasks.
2	1.5	Implementation	Install the required HW at each site.
2	1.6	Integration	Get the site connected to the core network.
2	1.7	Drive test and tuning	Testing of each sector and site
2	1.8	Commercial launch	Public launch of the new service
2	1.9	KPI monitoring	Monitoring of key performance indices
2	1.19	Final acceptance	Acceptance of the final product by the customer
3	1.1.1	Site survey	Perform detailed surveys to determine what is required.
4	1.1.2	Site access	Make sure that site access is provided for contractors.
5	1.1.3	Installation documents	Collocate the site requisites.
6	1.1.4	Approval of installation documents	Receive the final approval for the site plan.
3	1.2.1	Spectrum request	Make the request for a new spectrum to local authorities.
4	1.2.2	Approved spectrum	Get the approval.
5	1.2.3	Information collection	Allocate the spectrum to site/sector/cluster.
6	1.2.4	Radio network design	Design the entire RF plan.
7	1.2.5	Radio network design approval	Receive approval from the customer for the RF plan.
3	1.3.1	Final solution	Receive the final hardware solution for the project.
4	1.3.2	Received PO	Create a purchase order for HW.

WBS level	WBS code	WBS name	WBS description
5	1.3.3	Material ordering	Order hardware.
6	1.3.4	Material delivery	Ensure the hardware is delivered on time.
7	1.3.5	Customs clearance	Make sure the hardware is ready for clearance from customs.
8	1.3.6	Available material	Have the hardware available from the local warehouse.
3	1.4.1	Civil works	Select local contractors for civil works.
4	1.4.2	Power works	Select local contractors for power works.
5	1.4.3	Rigging works	Select Ericsson certified contractors for rigging works.
6	1.4.4	Work permits	Confirm work permits for all foreign contractors.
7	1.4.5	Accommodation	Reserve housing for foreign contractors.
8	1.4.6	Vehicle rentals	Acquire rentals for contractors.
9	1.4.7	Hoist truck rentals	Acquire suitably outfitted hoist trucks for rigging.
3	1.5.1	Site implementation	Installation of new hardware at the sites
4	1.5.2	Verification of site implementation	Guarantee that the HW installation is done according to design.
3	1.6.1	Site integration	Ensure the site connectivity goes back to the network core.
4	1.6.2	Backhaul testing	Guarantee that the core connectivity is as designed.
3	1.7.1	Individual site drive test and tuning	Perform mobile testing to verify sector position and site KPI.
4	1.7.2	Cluster drive test and tuning	Execute testing on groups of sites to ensure seamless voice and data handover.
3	1.8.1	Make sites public	Put sites in mode when the general public can access the services.
4	1.8.2	Verify that all sites are public	Confirm that all sites can be accessed by the general public.
3	1.9.1	Active monitoring of key performance indicators	Conduct disciplined monitoring of the KPI for a 30 day period.
4	1.9.2	Recommend fine tuning	From the observations of 1.9.1, recommend changes to parameters.
3	1.19.1	Acceptance of the LTE network by the customer	Handover of the network to the customer
4	1.19.2	Handover of network documentation	Relinquish project and network details to the customer.

4.2.6. Scope Changes

Ericsson uses a 3-step scope change process. Firstly, they record ALL potential reasons for recommended adjustments in a change tracking template, whether approved or not. Secondly, depending on the possible impact on scope, budget, and /or time due to the revision, the issue is discussed with the special team, including the project sponsor and high-level officials of Marketing, Finance, Operations, and Logistics. Finally, the change is documented in a change request form and goes through the process of validation until it is either accepted or rejected.

Change Tracking Form				
change #	description	process	estimated cost	approved by customer
1	Customer wants Antennas raised to new height on tower	Rigging	10 500	yes
2	Contractors want to rent accomodation in the south of the island to prevent long drives in the evening	HR	40,000	no
3				

Figure 18. Example of Change Tracking Form

Disclaimer

All changes on Network Configuration will required be submitted via Method of Procedure documentation and follow the process established on Change Control Management for the FLOW Network Operation.

Aside of the specify configuration change itself, the MOP must describe what impacts and changes on the network are expected, Issues what the change(s) want to address, etc. In the information main set that included answers What?, Why?, When?.

The CR's which represent impact at Network level (15+ sites for mobile for example) and/or impacts on end user functionalities, must be pass thru approval of the Change Control Board, who will reject automatically any procedure that it considered with not enough information in this MOP.

FOR CHANGE MANAGEMENT USE ONLY

- These guidelines need to be met for Major/Significant changes before proceeding to T-CAB.
- Where a specific guideline does not apply to change please check the N/A box.

GUIDELINES FOR CHANGES	COMPLETED
Risks and Mitigations identified	<input checked="" type="checkbox"/>
Specific outage time outlined	<input checked="" type="checkbox"/>
Services impacted identified	<input checked="" type="checkbox"/>
All relevant approvals received	<input checked="" type="checkbox"/>
Affected B2B customer(s) notified	<input checked="" type="checkbox"/> <input type="checkbox"/> N/A
Additional team(s) involved in change aligned	<input checked="" type="checkbox"/> <input type="checkbox"/> N/A
Testing completed /Report(s)received	<input type="checkbox"/> <input checked="" type="checkbox"/> N/A

Figure 19. Excerpt of Ericsson Change Management Template

4.2.7. Scope Control

The project manager controls the implementation of the scope of works through daily end-of-day meetings with the various team leads. The team executes the tasks described in the WBS and WBS dictionary. The project manager has to provide weekly status reports to the project sponsor alongside the heads of the Operations and Finance departments, indicating the project status. The reports include evaluations of the project variance to identify matters that may require attention and ensure general project compliance.

4.2.8. Scope Verification

The stated deliverables are validated for formal acceptance through scheduled interactions between the project manager, implementation supervisors, team leaders, the sponsor, network architects, and other team members. During these interactions, some are virtual; group decision-making techniques are used

when inspecting the status of the deliverables. During the virtual meetings, the use of photos and videos is essential, requiring that templates (ATP – acceptance test procedures) be utilized to ensure a certain standard is acquired. The ATP consists of a collection of tests that are applied to each deliverable; failure to pass these tests would imply that the objectives of that particular deliverable were not met.

As the project develops, the project manager will corroborate deliverables against the original project scope and grant provisional acceptance to deliverables submitted for review, once complete. The project sponsor and project manager deliberate on the formal acceptance of each deliverable, and once approved, they both sign off on the ATP. Items that failed to meet the specifications are reassessed by the applicable teams and then returned to the project manager for reconsideration. The quality management plan provides the necessary baselines and critical information used in the acceptance process and the project deliverable acceptance form.

2. Antenna System						
	Sector 1		Sector 2		Sector 3	
	SID	On site	SID	On site	SID	On Site
Height	36	18	36	18	36	18
Azimuth	135	135	230	230	318	318
Electrical Tilt	8/6	4	5/3	1	6/4	2
Mechanical Tilt	3	3	3	3	3	3
	<input type="checkbox"/> OK <input type="checkbox"/> Not OK <input type="checkbox"/> N/A			Comments		
Antenna(s) support correctly installed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Antenna(s) correctly fixed to the support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Antenna(s) Height, Azimuth, mechanical and electrical Tilts	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Antenna side jumpers connectors fixing and sealing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
RRUs side jumpers connectors fixing and sealing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
RRUs side fibers connectors fixing and sealing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
RRUs side power connectors fixing and sealing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
RRUs earthing according to standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

Figure 20. Example of Ericsson Site ATP

4.2.9. Plan Approval

An excerpt of the scope management plan acceptance template is below:

Approver name	Job title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

Scope Management Plan Revision History

Version	Date	Reason	Sign off

4.3. The Schedule Management Plan

The PMBOK Guide 6th Edition describes the schedule management plan as the process of establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule. The key benefit of this process is that it provides guidance and direction on how the project schedule is managed throughout the project. This process is performed once or at predefined points in the project.

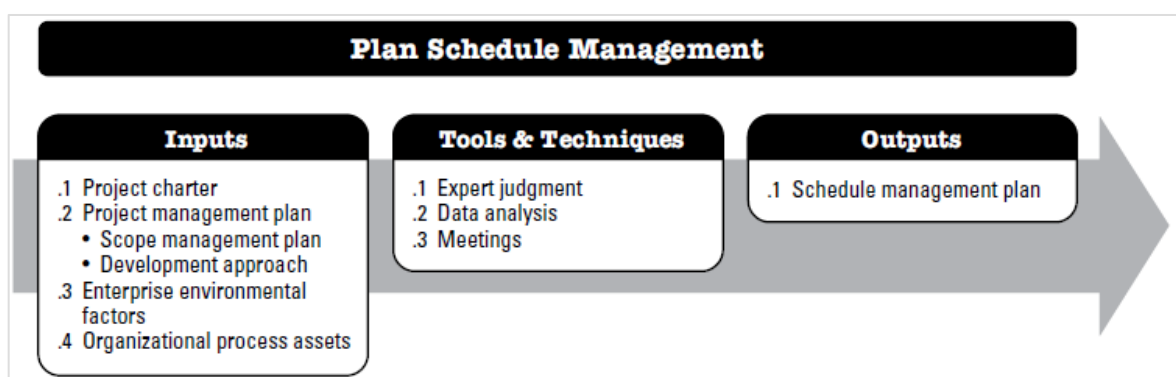


Figure 21. Plan Schedule Management: Inputs, Tools & Techniques, and Outputs

4.3.1. Introduction

The Saint Lucia LTE implementation project is time and cost sensitive; other islands will be also upgraded and therefore will require some of the subject matter

experts being used on this project. Additionally, the funding for this project is part of a larger pool delegated for network improvements in the islands. The project has a schedule for completion of 3 months.

4.3.2. Schedule Management Approach

The schedule management plan serves to establish the benchmark and procedures for developing, monitoring, and controlling the project schedule. The change management protocols are the only way that a request for change may be considered. The project manager has overall responsibility for schedule management.

4.3.3. Roles and Responsibilities

The roles and responsibilities for schedule development are below:

Chart 10. Roles and Responsibilities

Roles/Names	Responsibilities
Project manager	The project manager is responsible for work facilitation, package definition and sequencing, estimation duration, and resource assignment with and within the project team.
Project sponsor	Along with the PM and project team members, the project sponsor verifies the schedule. He also participates in schedule reviews and grants the final schedule approval before being base lined.
Project team members	They are responsible for the preparation of all required documentation that accompanies the schedule management. Also, they are active critics in the review process of the ongoing schedule.
Project scheduler	The project scheduler creates the project schedule using MS Project, and alongside the project team, stakeholders, project manager and project sponsors, and contractors, they come together to validate the schedule.
Contractors: riggers, installers, and IT specialists	They are responsible for performing their assigned duties in conformance with the schedule.
Ericsson network designers	They are responsible for the network design in accordance with local and international telecommunication regulations within the specified time to attain the requisite approvals.
Government ministries/local telecommunications regulatory agencies	They approve permits/requests in a timely manner.

4.3.4. Scheduling Method

The scheduling method used for this project is the critical path method. It is defined as a resource-utilization algorithm for scheduling a set of project activities. It requires the construction of a project model that includes the following:

- A list of all tasks required to complete the project
- The dependencies between the tasks
- The estimate of time (duration) that each activity will take to complete

The critical path is then determined by identifying the longest stretch of dependent activities and measuring them from start to finish.

4.3.4.1. The Scheduling Process

Project schedules will be created using MS Project 2017, starting with the deliverables identified in the project's work breakdown structure (WBS). Activity definition will identify the specific work packages, which must be performed to complete each deliverable. Activity sequencing is used to determine the order of work packages and assign relationships between project activities. Activity duration estimating is used to calculate the number of work periods required to complete work packages. Through resource estimating, the assignment of resources to the corresponding work packages is performed. The establishment of the project schedule involves analyzing activity sequences, resource requisites, and schedule durations and constraints. Once the schedule is developed, the project's sponsor will approve it, and it will then be baselined. Only the scheduler and the project manager will have access to edit the schedule. Activity resources were estimated using information from previous projects and with the input obtained from the expert judgment of the scheduler, project manager, and other team members.

4.3.4.2. The Activity, Schedule, and Resource Chart

Chart 11 reveals all of the activities, their expected durations, and assigned resources.

Chart 11. Activities, Expected Duration, and Assigned Resources

WBS	Task name	Duration	Predecessors	Resource names
1	St Lucia	97 days		
1.1	Site design	7 days		
1.1.1	Site survey information	0 days		Third party contractors
1.1.2	Site access	1 day		FLOW
1.1.3	Installation documents	4 days	4,3	Ericsson design team
1.1.4	Approval of installation documents	2 days	5	Ericsson design team
1.2	Network design	15 days		
1.2.1	Spectrum request	0 days	3	FLOW
1.2.2	Spectrum approval	1 week	8	NTRC
1.2.3	Information collection	3 days	3,6	Ericsson design team
1.2.4	Radio network design	3 days	3,6,10	Ericsson design team
1.2.5	Radio network design approval	2 days	11	Ericsson design team
1.3	Hardware	44 days		
1.3.1	Final solution	3 days	12	Ericsson design team
1.3.2	Received PO	2 days	14	Ericsson procurement
1.3.3	Material ordered	2 days	15	Ericsson procurement
1.3.4	Material delivery	14 days	16	Ericsson procurement
1.3.5	Customs clearance	3 days	17	FLOW
1.3.6	Material available	20 days	18	FLOW contractors
1.4	Contractors(selection of)	5 days		
1.4.1	Civil works	2 days	6	FLOW
1.4.2	Power works	2 days	6	FLOW
1.4.3	Rigging works	2 days	6	Ericsson certified installers
1.4.4	Work permits	5 days	6	FLOW/Ministry of Labour
1.4.5	Accommodation	2 days	6	Ericsson procurement
1.4.6	Vehicle rentals	2 days	6	Ericsson procurement
1.4.7	Hoist truck rentals	1 day	6	FLOW
1.5	Implementation	25 days		
1.5.1	Site implementation	25 days	24,18	Ericsson certified installers and FLOW contractors
1.5.2	Verification of site implementation	18 days		Ericsson field services
1.6	Integration	7 days		
1.6.1	Site integration	5 days	29	Ericsson network team
1.6.2	Backhaul testing	5 days		Ericsson network team
1.7	Drive test and tuning	10 days	32	
1.7.1	Individual site drive test and tuning	5 days	32	Ericsson field services
1.7.2	Cluster drive test and tuning	5 days	35	Ericsson field services
1.8	Commercial launch	1 day	34	

WBS	Task name	Duration	Predecessors	Resource names
1.8.1	Make sites public.	1 day	36	Ericsson network team
1.8.2	Verify that all sites are public.	1 day	36	Ericsson field services and Ericsson network team
1.9	KPI monitoring	16 days	37	
1.9.1	Active monitoring of key performance indicators	10 days	39	Ericsson network team
1.9.2	Recommend parameter fine tuning.	2 days	41	Ericsson network team
1.19	Final acceptance	0 days		
1.19.1	Acceptance of the LTE network by the customer	0 days	42	Ericsson field services and FLOW
1.19.2	Handover of network documentation	0 days	42	Ericsson field services and FLOW

4.3.4.3. The Gantt Chart, Project Baseline, and Critical Path

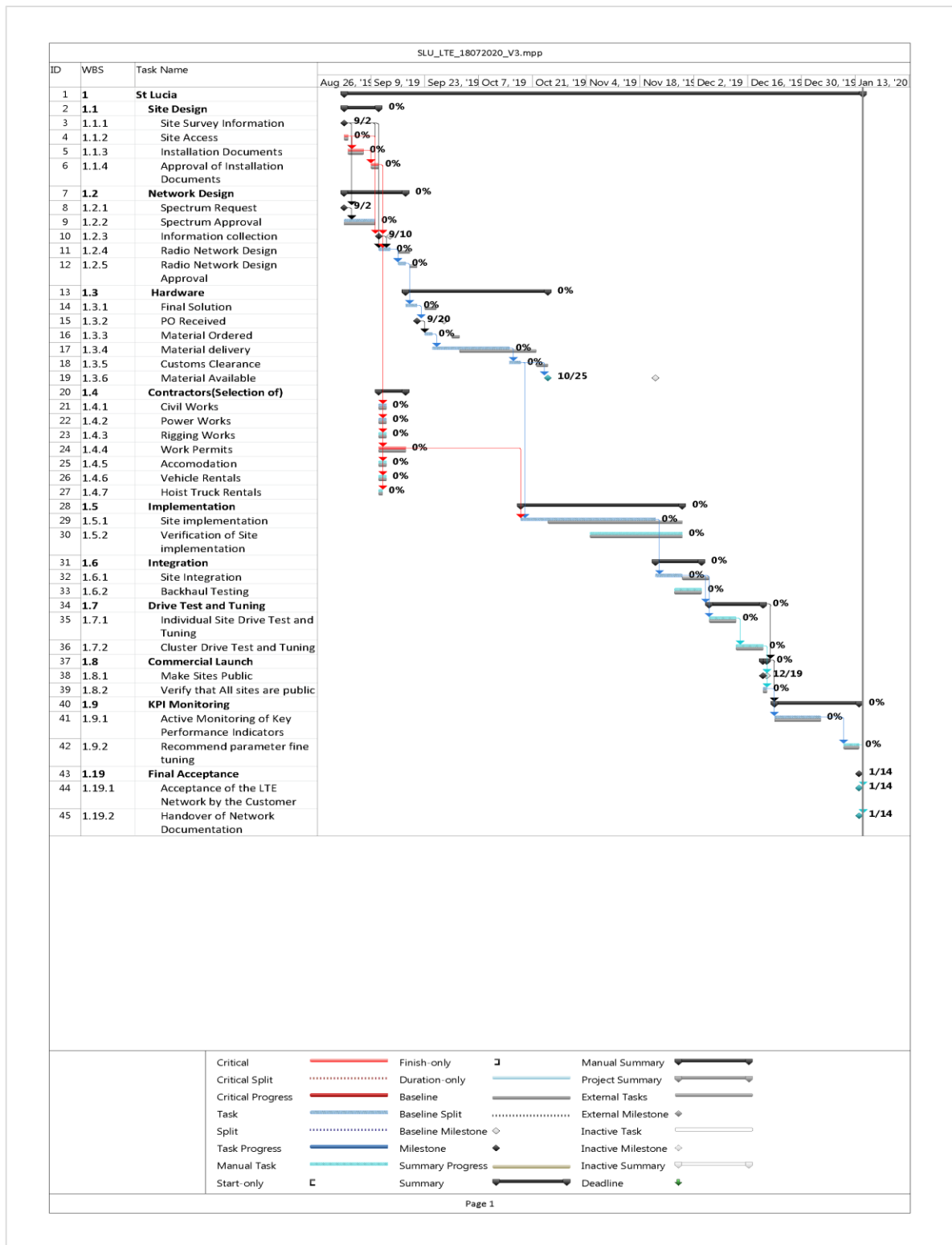


Figure 22. Gantt Chart, Project Baseline, and Critical Path

4.3.5. Schedule Changes

If a change to the schedule is considered necessary, the change will be logged through the change management process. The project manager, the project sponsor, and the relevant subject matter experts will examine the recommended change and determine whether it has merit and approve it. Once the change proposal is ratified, the project manager ensures that the schedule is adjusted and the changes recorded and then communicated to all necessary stakeholders.

4.3.6. Reporting on the Project Schedule

The project manager and the project team review the project schedule weekly. The actual project status is compared to the project baseline and the schedule variance calculated. The schedule control process involves regular data gathering on project performance, compared with the planned performance. The program team uses the following:

- Progress reporting – Reports detailing the actual start and finish dates of the activities
- The schedule variance is an indicator of whether the project is ahead, at, or behind schedule.

Schedule variance is calculated by subtracting the budgeted cost of work scheduled (BCWS) from the budgeted cost of work performed (BCWP). Variations in schedule are closely monitored and controlled, and efforts are made to implement corrective measures along the critical path activities.

All risks related to the schedule are documented in the risk management plan. They are continuously scrutinized and regularly updated to avoid potential project delays.

4.3.7. Schedule Management Plan Approval

The schedule management plan is reviewed and approved by the following:

Approver name	Title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

4.4. The Cost Management Plan

4.4.1. Introduction

The cost management plan defines the way the costs associated with the LTE upgrade project are managed. The plan follows the recommendations of the PMBOK® with regards to planning, managing, and controlling costs.

4.4.1.1. Approach

The LTE upgrade project is funded fully by capital expenditure earmarked for network improvement throughout the Caribbean in the 2017 and 2018 FLOW budgetary allocations. The specific designation is \$1.5M USD. The activities detailed in the work breakdown structure form the costs of this project. The estimated costs are derived from historical information on similar projects, current vendor bids' costs, and input from subject matter experts and experienced professionals within the Ericsson and FLOW PMOs.

The project's financial performance is observed and regulated with earned value calculations. Adequate corrective actions will be taken if cost variances are highlighted, after discussions between the project manager, project sponsor, subject matter experts, and other relevant stakeholders.

4.4.2. Roles and Responsibilities

Key stakeholders must adhere to and work within the constraints of the project and its cost management plan. The roles and responsibilities of the cost management plan are included in the table below:

Chart 12. Roles and Responsibilities - Cost Management

Names/Roles	Responsibilities
-------------	------------------

Names/Roles	Responsibilities
Project manager -	The PM is responsible for the day-to-day management of project funds and effects the expenditure of project funds in accordance with the cost management and the project budget allocation. The use of additional funding without the approval of the project sponsor is prohibited. The PM uses relevant metrics and variance analysis tools and techniques to provide updates to the project sponsor and other relevant stakeholders.
Project sponsor	The project sponsor is responsible for the approval of the project's cost management plan, budget, and corrective actions. In cases of critical or emergency situations, his approval is also required before the use of the project's funding.
Project team members	The project team is responsible for executing assigned work in accordance with the cost management plan. Additionally, they assist the PM with the implementation of metrics and variance analysis tools to guarantee the performance of all project deliverables is within the limitations of the budget.
Contractor - Ericsson	The contractor provides an initial cost estimate, which includes all activities associated with the project. Moreover, the contractor's WBS should include all implementation work packages and their affiliated costs. The responsibility is with the contractor to execute work packages within the approved budget and funding requirements.
Subject matter experts/consultants	The SMEs and consultants aid in defining accurate cost estimates for all activities.

4.4.3. Measuring Project Costs

Expert judgment and analogous estimation are the main tools used in establishing the activity costs. The project package evaluations are defined with the combined input of the individuals that have prior knowledge of similar kinds of projects as well as the accounts of similar projects previously executed by FLOW considering scope, budget, duration, and complexity. The estimated costs of individual activities or work packages are summed, and an authorized cost baseline is established.

The budgetary allocation for the execution of the project is \$1.5M USD. The cost baseline, which is the approved version of the project budget excluding the management reserve, is measured against the actual project performance. The

project manager actively monitors the project performance to ensure that it remains within budget.

Definitions:

- Cost estimate = sum of costs for work packages/activities
- Cost baseline = cost estimate + contingency reserve
- Budget = cost baseline + management reserve
- Management reserve = Budgetary allocation for known unknowns that is used when risks are realized for identified activities within the contract scope of work

Chart 13. LTE Upgrade Budget

WBS code	Activity	Cost estimate	Contingency reserve (6.5%)
1.1	Site design	\$20,000.00	\$1,300.00
1.2	Network design	\$100,000.00	\$6,500.00
1.3	Hardware	\$600,000.00	\$39,000.00
1.4	Contractors (selection of)	\$10,000.00	\$650.00
1.5	Implementation	\$255,000.00	\$16,575.00
1.6	Integration	\$20,000.00	\$1,300.00
1.7	Drive test and tuning	\$30,000.00	\$1,950.00
1.8	Commercial launch	\$0.00	\$0.00
1.9	KPI monitoring	\$20,000.00	\$1,300.00
1.19	Final acceptance	\$0.00	\$0.00
Total cost estimate		\$1,055,000.00	\$68,575.00
Cost baseline			\$1,123,575.00
Management reserve			\$369,250.00
LTE upgrade budget			\$1,492,825.00

Chart 14. Management Reserve Calculations

Risk	Probability	Value
Natural events: hurricanes and earthquakes	0.15	\$158,250.00
Resource/Material/Equipment delay	0.1	\$105,500.00
Revisions	0.1	\$105,500.00
Total management reserve		\$369,250.00

The contingency reserves were calculated as per each major work package and assuming a 6.5% rate based on telecom industry standards in the region.

4.4.4. Reporting Format

The end-of-week status reports will include the cost management updates with the particulars regarding the cost variance (CV) and the cost performance index (CPI). The goal is to maintain a $CPI > 1$. All cost variances outside the limits identified in section 4.7.3 will be reported to the relevant stakeholders to be followed by remedial action.

4.4.5. Cost Variance Process

Cost variances outside the recommended thresholds must be immediately highlighted, reported, and then corrected to return cost and/or schedule performance indexes to acceptable limits. The project manager, with the assistance of the project team, must provide the adequate corrective action to rescind the variances to accepted limits within a satisfactory period. The cost variance corrective plan details the efficacy of the selected actions and resultant measurements. Upon acceptance of the cost variance corrective action plan by the relevant stakeholders, it becomes part of the updated project plan.

4.4.6. Cost Change Control Process

The LTE upgrade project will use the earned value method approach to calculate cost variances that determine the project's budgetary performance: under budget, at budget, or over budget. This project has a fixed budget and a tight schedule; therefore, any negative variation reported in the cost performance index and cost variance will be considered unfavorable. The project manager has the responsibility of producing a corrective plan to correct negative variances and bring the project's performance back within budgetary constraints. The project manager calculates the actual costs for all the WBS elements and compares these to the projected baseline costs on a weekly basis. The comparisons are used to generate the data and status reports that form the basis for the CPI and CV ratios. Variances are calculated by deducting the actual costs from the earned value. The appropriate remedial action depends on the scale of variance:

- Positive cost variance (>0): The project work costs less than planned – if this occurs, there must be a detailed examination of the activities and associated costs to ensure the quality is not negatively affected.
- Negative cost variance ($<$): The project work costs more than planned – if this occurs, there must be an examination of the activities and their related costs to identify what are the circumstances causing the increased, unbudgeted expenditure. This would also require the activation of risk management strategies and possible additional measures, such as CV calculations per work package for better monitoring and control.
- Neutral cost variance ($=0$): This implies that the budgetary allocations are equal to the actual expenses or that there is zero variance. The project manager and team will continue to manage the project budget expenditure to ensure that the project remains on schedule.

The performance reviews that will be done weekly will include the following:

- Updating the schedule and actual costs associated with the current progress
- Inspections of the work done and that it matches with the budget
- Communicating project progress and budget uptakes to stakeholders

Figure 23 is a representation of the conditions of the earned value method in controlling costs on the project. The cost change control process follows the official project change request process (scope management plan). The project budgetary changes must be approved by the project sponsor.

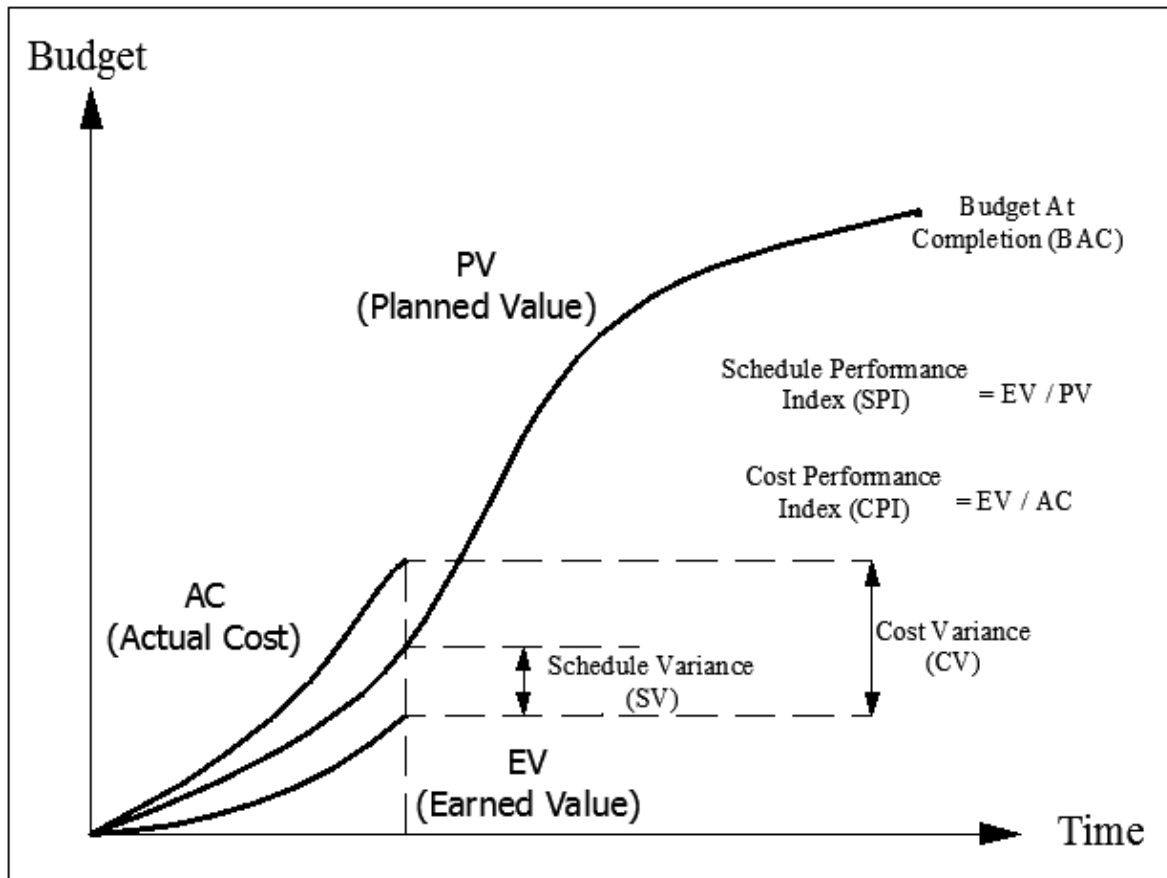


Figure 23. Detailing of Earned Value Management Metrics Retrieved from *researchgate.net*.

4.4.7. Cost Management Plan Approval

The signatures of the individuals below indicate an understanding of the purpose and content of the document, hereby making this the formal cost management plan for the LTE upgrade.

Title	Name	Signature	Date
Project sponsor	Alexander French		
Project manager	Sean Lewis		

4.5. Quality Management Plan

4.5.1. Introduction

The quality management plan for the LTE upgrade project established the activities, processes, and procedures for ensuring that the various aspects of the implementation were carried out to the worldwide-recognized Ericsson quality standard. Ericsson is a world leader in mobile infrastructure solutions and manages networks that service over a billion subscribers. Ericsson continues working towards its corporate vision of the networked society, and this requires an agile and flexible supplier capability that can evolve to meet new challenges whilst ensuring the highest quality and integrity of the supply chain. Ericsson expects a commitment from their suppliers to achieve a zero defect approach. (Ericsson Supplier Quality Handbook, May 2018).

4.5.2. Supplier Quality

Ericsson expects their providers/contractors/suppliers to have the following attributes:

- Rigorous process adherence and control
- Pro-active risk management
- Delivering fully conforming products
- On time deliveries

The Ericsson Supplier Quality Handbook (May 2018) states, “All suppliers must have a quality management system compliant to ISO 9001. If the supplier is not compliant (or third party certified) to ISO14001, they must follow requirements stated in Ericsson’s «Supplier Environmental Requirements» document.” Furthermore, Ericsson insists that the suppliers have a business continuity management system that covers the entire business and is communicated to relevant stakeholders.

Additionally, suppliers need to know and follow the US export/re-export rules (EAR & ITAR) and the local export rules to be able to deliver to Ericsson. They must also ensure that they do not use black-listed sub-contractors or personnel. All

suppliers must be aware of and comply with all requirements in Ericsson's code of conduct.

Ericsson's code of conduct includes requirements related to human rights and labor standards (including freedom of association, forced labor avoidance, fair employment conditions, working hours, corporal and financial punishment, child labor avoidance, elimination of discrimination, fair working conditions, information and training, the environment, and anti-corruption.)

All suppliers are required to be aware of and comply with all applicable occupational health & safety (OHS) requirements and all functional requirements in the 11 operational OHS standards. Supplier awareness and compliance of the requirements benefits the employees of the suppliers and reduces Ericsson's supplier-related business risk.

4.5.3. Ericsson Supplier Quality Assurance Plan (SQAP)

The SQAP is applied to all direct Ericsson suppliers that provide custom parts and assemblies, including products designed by Ericsson, the supplier, and products designed with co-operation between Ericsson and the supplier. It also serves as a general guideline for quality assurance requirements placed on all suppliers by Ericsson.

The purposes of the use of the SQAP tools and methods are to:

- Determine if all Ericsson designs, specifications, and requirements are properly understood by the supplier
- Identify potential problems before they occur and take actions to make sure that these risks are reduced to a minimum
- Ensure that suppliers take a systematic approach in order to be able to secure product requirements and process capabilities during a new product introduction
- The manufacturing process has the capability to produce conforming parts in the actual production environment

Ericsson suppliers who are compliant with the tools and methodology of the SQAP supply the hardware and equipment used on the Saint Lucia LTE upgrade project.

4.5.4. Project Quality Requirements

The project manager, alongside the project team, determines the quality standards and requisites of the final product. The standards are based on telecommunication implementation best practices, environmental and safety regulations, and the protocols of the Eastern Caribbean Telecommunications Agency (ECTEL). The network design (architectural framework) is a crucial part of the project; it specifies the key attributes of the physical layer:

- Domains: small cell, macro, transport, and core network
- Multiple spectrum bands: bands 2 & 13 (LTE)
- Multiple radio access point for factors: macro cells, small cells, and distributed radios

The implementation team, alongside the FLOW local team, will be providing updates to the PM and the project team using the network design as the benchmark. These updates will be used by the PM to quantify the metrics that define quality. As the project proceeds, these metrics will be analyzed to determine the quality of each process. The project has to achieve all required quality assurances to be accepted by the customer.

4.5.5. Quality Assurance

Quality assurance is defined as the process of auditing and analyzing the systems that produce a product in order to improve their quality. Regarding the LTE upgrade project, an iterative quality assurance process will be used throughout the life cycle of the project. That process includes measuring metrics, analyzing process data, and continuously improving the processes as necessary. To perform quality assurance, the project team performs the following steps:

- Analyzing similar projects performed as well as reviewing lessons learned to take advantage of the methodology used through benchmarking and best practice implementation
- Ensuring that the main stakeholders fully understand the telecommunication regulatory standards and best practices
- Ensuring that the best management practices are always implemented in all the projects' processes

The LTE upgrade project permits the government regulatory bodies and the customer to visit the various site installations to review documentation and/or conduct project audits. The systematic verification and monitoring of project results periodically through internal and external quality audits and inspections provides the detection and correction of deviations and errors in the project. The recommended key performance metrics and established tolerances are below:

Chart 15. KPIs and Tolerances

Process action	Acceptable process standards	Process phase	Assessment interval
Power installations	New 50 amp breakers installed at each site with adequate cable labelling	Site prepping phase	Before the installation of the new equipment
Towers/poles are safe to climb.	100% compliance	Implementation phase	Before the installation of the equipment on the towers or poles
Sites/sectors can process data calls.	100% completion	Implementation phase	At the end of the implementation of each site
Implementation status report	Zero (0) non-compliance	Implementation and closeout	Weekly frequency

4.5.6. Quality Control

Quality control (QC) activities include monitoring and recording the results of quality assurance, measuring quality performance levels, and recommending necessary changes (corrective actions) to the overall quality management plan. To control project quality:

1. Specific responsibilities are assigned to project members for overseeing and verifying that requirements are delivered.
2. Weekly progress reports are prepared and communicated to the team to verify that the results are accurate and in alignment with the project scope.
3. The results obtained from the quality audits shall be analyzed. Immediate corrective or preventative actions are to be implemented, as required in accordance with the established integrated change control process, and change logs will be updated.
4. Cost and schedule performance will be monitored by examining planned versus actual results. The source of variances will be identified, and the necessary corrective actions will be performed.

The tools used by the project team for quality management are the following:

- Weekly project meetings: The assigned project members gather, analyze, and compare data with the controls identified. They need to compare quality control measurements with established control limits and tolerances. All results are communicated formally in reports and through meetings.
- Use of control tools, such as tables: The control tables help monitoring, controlling, and improving processes over the project lifecycle.
- Check sheets: These are primarily used as a data collection tool.
- Audits: Conducting regular audits ensures that the project is progressing as planned. (The recommended audit frequency will be at 25%, 50%, 75%, and 95% of project completion). Audits will include the following:
 - Analyzing quality control data to determine if quality problems exist
 - Identifying process improvements that will increase quality
 - Performing a root cause analysis to determine necessary improvements
 - Determining preventative actions to deter future quality issues

The LTE upgrade project results must follow the established standards and tolerances and will be formally accepted by the representatives of field services and the customer.

4.5.7. Quality Management Plan Approval

The signatures of the people below indicate an understanding in the purpose and content of this document by those signing it.

Approver name	Title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

Revision History

Version	Date	Reason	Executive sponsor sign off

4.6. Resource Management Plan

4.6.1. Introduction

Ericsson is a global provider of information and communication technology (ICT) to service providers, and as an organization, it is committed to operational health and safety, environmental sustainability, resource management excellence, and the Code of Business Ethics. Ericsson uses a resource plan to forecast the resources necessary to execute their projects. The resource plan covers the current availability of resources (headcount), their competencies, a recruiting plan, and periods where excess capacity might exist. The resource plan shows whether the resource utilization is based on current, planned, or envisioned work. The resource plan is prepared based on the competence of the resources and not by assigning specific individuals to the projects.

4.6.2. Roles and Responsibilities

All project team members (internal and external) must clearly understand their roles and responsibilities. The competencies required by the project staff, their corresponding roles and responsibilities, and the materials and equipment required were compiled using expert judgment, lessons learnt from other projects, network design recommendations, and Ericsson PMO standard procedures.

Chart 16. Ericsson Expected Competency by Role

Role	Responsibility
Project sponsor	<ul style="list-style-type: none"> - The project sponsor maintains open communication channels with the project manager and project team and gets involved when required.
Project manager	<ul style="list-style-type: none"> - The project manager is responsible for evaluating the performance of the project team. - The project manager ensures that communication protocols regarding all stakeholders are properly enacted.
Network design engineers	<ul style="list-style-type: none"> - They are responsible for incorporating the necessary requirements, specifications, and installation criteria for the project success within the formal network design. - They support the PM and project team in defining the required resources (persons and materials) for the project. - To maintain open communication channels with the project manager and team members - To resolve or aid in resolving discrepancies and/or conflicts within the project process to avoid delays - To behave and perform in an appropriate and ethical way
Project team	<ul style="list-style-type: none"> - They participate in the project meetings and provide updates of the project on a daily basis. - They ensure that they are properly trained on their respective roles. - They behave and perform in an appropriate and ethical way.

Role	Responsibility
Contractors	<ul style="list-style-type: none"> - They participate in the project meetings and provide daily updates. - They behave and perform in an appropriate and ethical way.
Field services	<ul style="list-style-type: none"> - They are responsible for ensuring compliance and communicating any deviation or problem to the project manager. - They behave in an ethical way.
Ericsson HR	They coordinate training schedules and locations.
Manager	<ul style="list-style-type: none"> - The manager will provide the training status to the project manager. -The manager assists the project manager in identifying training resources and associated costs.
Quality assurance manager	<ul style="list-style-type: none"> - The quality assurance manager assists the project manager in ensuring the project quality and communicating it adequately to the team and stakeholders.

4.6.3. Staffing Skills and Competencies

Since Ericsson implementation projects are related to telecommunications and information and communications technology, Human Resources must ensure that the appropriate skills, knowledge, ethics, principles, and experience are selected to fulfill the project requirements. The competencies and capabilities required of project team members to adequately complete assigned tasks and activities within the set time and quality parameters were categorized as the following:

1. Proficient
2. Competent
3. Learner
4. Novice

The table below includes the level of competency required for each role.

Chart 17. Ericsson Expected Competency by Role

Skills	Project manager	Design engineer	Field engineer	QA manager	Implementation engineer	Contractors	Cost controller	Resource manager	EHS inspector
Leadership/Management	1	1	1	1	1	2	2	1	1
Budgeting	1	2	2	2	2	2	1	3	3
Scheduling	1	2	1	2	1	2	1	3	3
Executive communication	1	2	2	2	2	3	2	1	2
Quality experience	1	1	1	1	1	2	2	2	2
Compliance experience	1	1	1	1	1	2	2	2	1
Safety experience	1	2	1	1	1	2	2	3	2
Design experience	2	1	2	2	2	3	2	4	4
Telecom codes	2	1	1	1	1	2	2	4	3

4.6.4. Assumptions and Constraints

Resource type	Topic	Assumption/Constraint
Human resources	Staff participation	The Ericsson staff assigned to the project will be able to participate as the project requires.
	Training funding	The available training funds will be enough to prepare the project participants.
	External staff	Non-Ericsson staff will be available to participate during the proposed time, and no additional time or replacement will be required.
	Regular work week	A regular work week is from Monday to Friday, from 9am to 5pm, 40 hours per week.
Other resources (materials)	Material availability	The assumptions are that the materials required for the daily project administrative processes have been sourced by Ericsson Procurement and are readily available; also, the implementation hardware will be accessible at the time of project execution.
	Material specifications	All material required for the project implementation is provided by Ericsson in compliance with the design specifications.

Activities	Project manager	Design engineer	Field engineer	QA manager	Implementation engineer	Contractors	Cost controller	Procurement manager	Human resource Manager	EHS inspector
Requirement gathering	A	R	I	R	I	C	I	C	R	I
Change requests	A	C	C	R	C	C	C	C	C	I
Site management	A	C	R	C	R	I	I	I	I	I
Permits/Approvals	A	I	I	I	I	I	I	I	I	C
Project scope	A	C	C	C	R	I	C	R	I	C
Project communication	A	I	I	I	I	I	C	I	I	C
Project quality	A	C	R	R	R	I	I	C	I	C
Stakeholder management	A	I	I	I	I	I	I	I	R	I
Accounting	A	C	I	I	I	I	R	C	I	I
Status reports	A	C	C	C	R	R	C	I	C	C
Site worker management	A	I	C	I	R	I	I	I	R	I
Procurements	A	I	I	I	I	I	I	R	C	I

R – Responsible for completing the work

A – Accountable for ensuring task completion/sign off

C – Consulted before any decisions are made

I – Informed of when an action/decision has been made

4.6.6. Resource Estimate

The project circumstances apropos funding, scheduling, and scope requirements stipulate that the human resource estimation be based on expert judgment and the use of published estimating data. The utilization of smart phones has minimized the need for communication equipment and office supplies: laptops, printers, scanners, etc. Contractors must each have their smart phone, and they

will be provided local SIM cards by the customer for the duration of the project. The local and remote teams will engage through Whatsapp chat groups – enabling the instantaneous sharing of pictures and videos and installation statuses.

The network design group defines and estimates the materials required for the LTE implementation and provides the contractors with the certified drawings and specifications. Ericsson, as the project contractor, provides all required project material in compliance with the requirements detailed in the quality management plan based on the specifications provided by the network design.

Chart 19. LTE Upgrade Estimated Human Resources

Role	Resources required	Type of resources
Project manager	1	Internal
Network design	3	Internal
HR manager	1	Internal
Quality assurance manager	1	Internal
Environmental and health & safety supervisor	1	Internal
Accountant	1	Internal
Field engineer	3	Internal
Procurement manager	1	Internal
Contract teams	10	External

4.6.7. Staffing Management

4.6.7.1. Staff Acquisition

The LTE upgrade project requires Ericsson’s internal and non-Ericsson staff to perform the required project activities. The project manager deliberates with the HR team to source the adequate staff for the project roles. Staff may be replaced

by redirecting resources from within or from outside the project, or their workload may be absorbed by other staff.

4.6.7.2. Virtual Team Management Process

Virtual meetings are an integral part of the project processes, since project team members like the project manager, quality assurance manager, project sponsor, network design group, and human resource manager will not be on the island. Conferences will be through Skype, Google Meetings, WhatsApp group chats, and Microsoft Team meetings. All stakeholders are responsible for having the corresponding tools for the scheduled virtual meetings.

4.6.7.3. Resource Calendar

The table below summarizes the resource allocation aligned with the proposed schedule per project deliverable.

Chart 20. General Resource Calendar Table

WBS	Task name	Duration	Start	Finish	Human resources
1.1	Site design	7 days	Mon 9/2/19	Tue 9/10/19	Network designers, project manager, and contractors
1.2	Network design	12 days	Mon 9/2/19	Tue 9/17/19	Network designers, project manager, QA manager, EHS supervisor, and legal authority
1.3	Hardware	27 days	Wed 9/18/19	Fri 10/25/19	Procurement manager, accountant, network designers, and project manager
1.4	Contractors (selection of)	5 days	Wed 9/11/19	Tue 9/17/19	HR manager, project manager, accountant, QA manager, and legal authority

WBS	Task name	Duration	Start	Finish	Human resources
1.5	Implementation	30 days	Fri 10/18/19	Thu 11/28/19	Project manager, field engineers, EHS supervisor, contractors, and QA manager
1.6	Integration	8 days	Fri 11/22/19	Tue 12/3/19	Project manager, contractors, Network designers, and QA manager
1.7	Drive test and tuning	10 days	Fri 12/6/19	Thu 12/19/19	Contractors, project manager, and QA manager
1.8	Commercial launch	1 day	Thu 12/19/19	Fri 12/20/19	Project manager, network designers, QA manager, and legal authority
1.9	KPI monitoring	16 days	Mon 12/23/19	Mon 1/13/20	Project manager and QA manager
1.19	Final acceptance	0 days	Tue 1/14/20	Tue 1/14/20	Project manager, legal authority, customer, QA manager, and procurement

4.6.7.4 Team Development Plan

The project manager monitors and documents team member interactions and seeks to improve staff competencies and the overall collaborative environment.

4.6.7.5 Skills and Competency Development

The project manager presumes that the project team members - internal or external resources – are fully competent within their specific roles. The staff have been successfully utilized in similar projects in the recent past, and therefore, no additional competency development is required.

4.6.8. Performance Reviews

The project manager monitors, manages, and reviews the overall performance of the project during the project's lifecycle. The field engineer provides daily status reports of the activities and the performance of the contractors. Daily management of assigned project staff and contractors is the responsibility of the project manager. However, the HR manager is accountable for the internal staff, their evaluations, performance issues, recognition, promotions, and disciplinary actions. Managing resources includes the appraisal of the employees' performance during the project performance. The personnel report provides the basis for managerial decisions on how to manage the project team. Employee performance metrics include the following:

- Quality of completed activities
 - Work behavior
 - Job-related attributes

After conducting the employee performance reviews, the PM should:

- Provide feedback to employees about the areas under review
- Take corrective actions where necessary
- Reward excellent performance to encourage continued brilliance

4.6.8.1. Recognitions and Rewards

Ericsson's project internal employees are rewarded for excellence in execution and performance with economic compensation based on Ericsson protocols.

4.6.9. Conflict Management

Conflicts during projects are usually caused by personality differences, role conflict, limited resources, lack of information, poor communication, and high stress levels. Although proper planning, good communication, and team building exercises can reduce the occurrence of conflict, it may still emerge. The PM is responsible for managing conflict that can negatively affect the team or the

project's success. The effectiveness of a conflict resolution approach depends on the situation, but at its root, it is defined by the following:

- Evaluating the situation, including gathering data and relevant information and observation of all the parties involved
- Actively listening and communicating
- Partnering with the team to build trust, create leaders, and minimize conflict
- Negotiating

4.6.10. Resource Management Plan Approval

The project sponsor and project manager are responsible for signing, hereby formalizing the resource management plan for the LTE upgrade.

Name	Title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

4.7. Communication Management Plan

4.7.1. Introduction

The LTE upgrade communication management plan coordinates the communication structure for the project. It serves as a template for the divergence of information to relevant stakeholders throughout the project. Changes may be made to the plan when necessary. The communication management plan details how project information is collected, reported, and distributed to the relevant stakeholders. The project is time-sensitive, and therefore, open communication channels and frequent meetings are encouraged.

4.7.1.1. Approach

The communication requirements are documented in accordance with the recommendations included in the PMBOK® Guide. The project manager is

proactive in ensuring effective communication on the project. As with most project plans, updates or changes may be approved as the project progresses. The project manager is responsible for managing all proposed and approved changes to the communication management plan.

4.7.2. Assumptions and Constraints

The following assumptions and constraints are considered in this communication management plan:

- All project communication activities will occur within the project's approved budget, schedule, and resource allocations.
- Communication activities will occur in accordance with the guidelines detailed in the communication matrix to ensure the adherence to schedule constraints.
- The project sponsor must approve all deviations from the timelines that may result in excessive costs or schedule delays.

4.7.3. Communication Management

4.7.3.1. Standardization Process

Ericsson enforces the standardization of processes as a tool to simplify the complexities of project management communication. The project team uses the Ericsson standard organizational formats and templates for all formal project communication.

4.7.4. Stakeholder Identification Requirements

As part of the project stakeholder identification and by using his expert judgment and following Ericsson communication standards, the project manager will determine the frequency and the methods of communication to be implemented. As part of the stakeholder registry process, the project manager will identify stakeholders' requirements in order to align the communication methods to their expectations.

Chart 21. Project Stakeholders' Identification and Requirements

Stakeholder type	Responsibility	Stakeholder information requirements	Timeframe/Frequency
Sponsor	The sponsor is responsible for providing resources and support for the project for enabling success. The sponsor authorizes the project, funding, and possible changes. He is available for updates from the project manager and project team.	The sponsor provides input to requirements.	Prior to the completion of a significant project milestone
		The sponsor approves project deliverables.	Upon completion of a significant project milestone
Project manager	The project manager coordinates overall project activities and is responsible for providing updates and keeping stakeholders aligned with the project requirements and status. He will resolve any conflicts and keep the stakeholders informed.	The project manager receives updates on the project progress.	Daily
		The project manager ensures open communicating channels with the project sponsor.	Weekly
		The project manager directs the communication with the project team.	Daily
Network design engineers	They assure that all project requirements are included in the project design and all relevant documents are updated as required.	They receive updates on the project progress and provide inputs or recommendations while updating the drawings and specs as needed.	As required by the project manager, that is, more frequently if needed or upon completion of a significant project milestone
Functional managers (human resources, quality, procurement, and legal)	They provide support to the PM regarding internal resources and the technical aspects that may affect the operation.	They receive project progress reports.	Weekly
		They provide input on project requirements.	As needed
Technical team members (scheduler, cost control, and field engineer)	They keep relevant project documents and activities updated and provide status reports at appropriate times.	They provide and receive updates on the project progress.	Weekly
Quality	They perform quality and	They provide and	Weekly

Stakeholder type	Responsibility	Stakeholder information requirements	Timeframe/Frequency
assurance professionals	assurance audits and present reports.	receive updates on project progress performance.	
FLOW marketing team	They represent the interests of the customers.	They receive updates on the project progress.	Weekly
		They provide customer feedback.	They will contact the project manager as required.
Inspectors/FSO	They communicate field observations and/or provide feedback in a promptly manner.	They provide and receive updates on the project progress.	Bi-weekly or as needed
		They have direct communication with the technical team.	Bi-weekly or as needed
Regulatory agency	They ensure the compliance with regulatory requirements and provide recommendations.	They provide and receive updates on the project progress, in accordance with Telecom standards.	They will contact the project manager as required.
		They direct the communication with the technical team and project manager.	

4.7.5. Communication Escalation Process

Efficient and timely communication is crucial to the successful project completion. As issues or complications arise regarding project communications, it becomes necessary to escalate the issue if the resolution eludes the project team. In order to ensure successful project schedule and issue resolution, the project uses its standard escalation model to provide a framework for escalating communication issues. Chart 22 defines the priority levels, decision authorities, and timeframes for resolution.

Chart 22. Communication Escalation Process Summary

Priority	Definition	Decision authority	Timeframe for resolution

Priority	Definition	Decision authority	Timeframe for resolution
Priority 4	It is an insignificant impact to the project, but there may be a better solution.	Project manager/project technical team	The work continues, and recommendations are submitted via the project change control process.
Priority 3	It is a slight impact that may cause minor project scheduling difficulties and/or costs.	Project manager	Within 3 business days
Priority 2	It is a medium impact to the project that may result in some adverse impacts to costs and/or schedule.	Project sponsor	Within 24 hours
Priority 1	It is a major impact to the project; if it is not resolved quickly, there would be a significantly negative impact to the project schedule, cost, or quality.	FLOW chief technical officer	Within 8 hours

4.7.5.1. Issue Log

The project team maintains an issue log (template below) to record all issues confronted in the project life cycle. Relevant personnel are assigned according to their expertise, experience, and competences to ensure the success of the project despite disruption. The project manager is responsible for managing the issue log with the support of the project team.

Chart 23. Issue Log Template

#	Description	Reported by	Date	Responsible officer	Priority	Actions or progress notes	Status	Date resolved

4.7.6. Project Team Directory

To ensure timely and agile communication, a project team directory will be prepared and updated as required. A template is included in the table below for reference.

Chart 24. Project Team Directory Template

Role	Name	Title	Organization/Department	Email	Phone

4.7.7. The Project Communication Status

Chart 25. The Project Status - Communication

Assembly	Objectives	Mode	Regularity	Audience	Owner	Deliverable	Format
Kickoff meeting	To introduce the project and the project team to review the objectives and management approach	Virtual	Once	Project sponsor, project team, and stakeholders	PM	Agenda and meeting minutes	Soft copy archived on the project SharePoint site
Project team meetings	To review the activity status of the project with the team	Virtual	Weekly	Project team, and network designers	PM	Agenda, meeting minutes, and project schedule	Soft copy archived on the project SharePoint site
Technical design meetings	To discuss and develop technical design solutions for the project	Virtual	As needed	Project technical staff	Technical lead	Agenda and meeting minutes	Soft copy archived on the project SharePoint site
Lessons learned sessions	To record all good and bad decisions and associated results and the analysis to be used as guidance for other projects	Virtual	As needed	PM, stakeholders, project sponsor, and required team members	PM	Lessons learnt document update	Soft copy archived on the project SharePoint site
Project status meetings	To provide a report on the project status to the project sponsor	Virtual	Weekly	Project sponsor, stakeholders, PM, and required team members	PM	Slide updates and project schedule	Soft copy archived on the project SharePoint site
Project status reports	To report the status of the project including activities, progress, costs, and issues	Emails, phone calls, and virtual	Daily, weekly, and monthly	Project sponsor, project team, and stakeholders	PM	Project status report and project schedule	Soft copy archived on the project SharePoint site
Post-Review	To measure, analyze, and record the actual vs planned performance after each phase completion and at project closeout	Emails, virtual, and phone calls	Every time a project phase is complete and at the end of the project	Project sponsor, stakeholders, PM, and designated team members	PM	Report and record results	Updated soft copy shared with relevant stakeholders

4.7.8. Communication Methods and Technologies

A project management information system (PMIS) is the coherent organization of the information required for an organization to execute projects successfully. A PMIS is typically one or more software applications and a methodical process for collecting and using project information. Ericsson keeps a SharePoint platform available for all its projects as a way to provide updates, storage data, and conduct project communications through a standard process. For external resources, a link will be provided to allow access as required and established by the Ericsson procedures.

4.7.9. Communication Monitoring and Reporting

The project's work performance results are communicated to stakeholders through performance/status reports. The reports should provide all the information needed by stakeholders to the level of detail required by them. From the project management plan, the information required to identify the report performance baselines is obtained. Performance reports follow the Ericsson standards and procedures and include the following communication guidelines:

Chart 26. Recommended Reporting

Report	Measure	Frequency	Responsibility
Project performance, processes, & forecasts	Earned value, planned value, actual cost, SPI, CPI, schedule variance, and cost variance	Weekly	The project manager with the support of the required project team members
Lessons learned review	Good and bad decisions and associated results	At the end of the project	The project manager with the support of the required project team members
Post project review	Baseline opportunities	At the end of every project phase and at the project closeout	The project manager with the support of the required project team members

4.7.10. Glossary of Communication Technology

Chart 27. Glossary of Ericsson Communication Terminology

Terms	Definitions
Communication management plan	Portion of the overall project management plan that details how the project communication will be conducted: the participants, frequency, and method of communication
Communication	The imparting or exchanging of information or news; ideally, the information received should match the information sent. It is the responsibility of the sender to ensure this takes place.
Stakeholder	Individuals or groups involved in the project or whose interests may be affected by the project's execution or outcome
Escalation	The process that details how conflicts and issues will be passed up to the management chain for resolution, as well as the timeframe to achieve resolution

4.7.11. Sponsor Acceptance

Approver	Title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

Revision History

Version history	Date	Reason	Executive sponsor sign off

4.8. Procurement Management Plan

4.8.1. Introduction

The procurement management process of the LTE upgrade project utilizes the stages of plan procurement management, conduct procurement, and control procurement. The plan provides the identification of the requisite items, the types of contracts, and the contract approval process and takes into consideration procurement risks and constraints.

4.8.1.1. Procurement Management Approach

The installation activities of the LTE upgrade project aim to enhance 70 existing WCDMA/GSM sites to LTE technology. Ericsson has successfully implemented similar projects in larger markets in various countries in the region and has an accumulation of experience, knowledge, and skill sets. The project and procurement managers, with additional support of the project team, have the overall responsibility for the procurement of the necessary material and resources. The project manager may delegate specific responsibilities to team members to assure that all items procured are relevant to the successful completion of the project. The project manager works with the project team, contracts/purchasing department, and other key players to manage the procurement activities from their initiation to their closing.

4.8.2. Procurement Definition

A limited number of contractors perform the project activities, since Ericsson's staff composes the design, network configuration, procurement, and monitoring teams. The project manager and the network design teams, with the support of the project team and the procurement manager, define the project requisites in the Chart 28.

Chart 28. Procurement Items/Services

Item	Purpose/Justification
------	-----------------------

Item	Purpose/Justification
Ericsson staff	Ericsson staff is responsible for material acquisition, equipment sourcing, remote connectivity testing, and remote network monitoring.
Ericsson ASPs (authorized service providers)	ASPs are responsible for all rigging duties, on site configurations, drive testing and final onsite network tweaking, providing daily updates, and ensuring compliance with.
FLOW ASP/Contractors	Flow contractors are responsible for providing the required electrical and transmission connectivity, project material storage, timely delivery to sites, and waste material removal from sites for disposal.
Field service operations	To inspect and ensure compliance with codes and design and provide daily updates

Regular monthly-compensated Ericsson staff will support all other services related to project management.

4.8.3. Types of Contracts

The LTE upgrade project's scope is part of the Ericsson portfolio of activities. Ericsson's network services have evolved to ensure that they can be delivered in a fast, efficient, accurate, and sustainable way, allowing the service provider to capitalize on the opportunities created by faster data speeds. Ericsson's project management, site engineering, civil works, installation, product configuration, and integration capabilities cover end-to-end deployments from site acquisition to customer acceptance. Since similar projects have been successfully performed in The Bahamas, Jamaica, Cayman Islands, and Barbados, there are ample data, documentation, and experienced resources to ensure an appropriate procurement process. The LTE upgrade restoration activities are well defined; therefore, a fixed-total-cost contract was granted to Ericsson. Based on this contract, Ericsson assumes the risks for unexpected increases in labor and materials that are needed to provide the LTE upgrade in the required timeline.

4.8.4. Procurement Cost Determination

The project manager issues a request for quote (RFQ) to solicit proposals from ASPs that can provide the services and materials required for the project. The

ASPs outline their breakdowns in their proposals, including the methodology for completing the assignments, who will perform the job, and their relevant experience. Proposals that omit solicited information or contain incomplete details will be discarded from deliberations. Costs are used as part of the decision criteria; however, experience in this type of project will be considered a priority.

4.8.5. Procurement Risks and Constraints

Liberty Global/FLOW, considering that their direct competitor has already launched the 4G technology and there are signs of FLOW customers moving to the competition, deems the LTE upgrade integral. Ericsson, governed by the fixed-total-cost contract, is responsible for 95% of activities required for the project execution and success. Risks and uncertainties regarding the ASPs are analyzed and managed to ensure project continuity in case of ASP failure to comply with contract requirements. Every effort must be made to identify all constraints prior to any procurement planning, since unmanaged risks can significantly impact the project's success. Due to the uncertainties regarding the procurement procedure, specific risks to the process are tabled below to remind the team members of their likelihood.

Chart 29. LTE Upgrade Procurement Risks

Risks
Nonobservance of the design criterion in received hardware
Falsification of ASP data re: training and/or expertise
Reception of incorrect equipment at site
Safety issues
Environmental incidents
Negligence with regards to scheduling

4.8.6. The Contract Approval Process

All ASP proposals are received in an open and transparent bidding process. The project and procurement managers are responsible for managing the bidding process. All procurement management transactions are executed within the Ericsson Code of Business Ethics; this ensures business responsibility and reminds everyone that every action counts.

4.8.7. Decision Criteria

The project manager, cost control experts, procurement manager, legal authority, and designated project members meet to evaluate proposals and grant the contracts.

4.8.9. Control Procurement

All decisions and documents regarding procurement are subject to an audit process and are stored electronically in the project SharePoint in the corresponding file. As part of the contract, ASPs are required to accede to the conditions, restrictions, penalties, internal processes, and standards required during the project execution. The field engineers and FSO staff will perform ASP evaluations, providing status updates to the PM and team at the end of the day. The PM maintains a ASP competency log that is updated weekly as part of the project metrics. Each metric is rated on a 1-3 scale and a computed transactional efficiency calculation.

Chart 30. ASP Competency Log

ASP	Product quality	Punctuality	Documentation quality	Development costs	Costs/ Unit	Transactional efficiency
ASP-1						
ASP-2						

Key: 1-Unsatisfactory, 2-Acceptable, and 3-Exceptional

ASPs with an efficiency result of less than 75% will be informed officially of their questionable status (email and phone call), which obliges the ASP to respond with a written justification of the present status, a mitigation proposal, and a commitment plan to comply with the efficiency performance within 3 days. If the

ASP fails to comply with the stipulations, this will trigger the cancellation of the vendor's ASP status.

4.8.10. ASP Management

The Ericsson procurement department provides supervision and assistance regarding purchasing and contracting; however, the project manager has the accountability and responsibility for the ASP project performance.

4.8.11. Sponsor Acceptance

The project sponsor and project manager approve the procurement plan after careful review. Alterations or adjustments may be done after the collaboration with the undersigned or their designated representatives.

Approver name	Title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

Revision History

Version	Date	Reason	Sign off

4.9. Risk Management Plan

4.9.1. Introduction

The PMBOK® Guide defines a risk as an uncertain event or condition that, if it occurs, could have a positive or negative effect on one or more project objectives. Project risk management is the process of identifying, assessing, responding to, monitoring, and reporting risks over the lifecycle of the project. The risk management plan defines how risks associated with the LTE upgrade project are identified, analyzed, and managed. It outlines how risk management activities

will be performed throughout the lifecycle of the project while providing templates and practices for recording and prioritizing risks.

The project manager, alongside the project team, created the risk management plan in the planning phase; however, the risk management plan will be monitored and updated throughout the project lifecycle. As such, this risk management plan provides the methodology to identify and quantify the risks to the project, determine the consequence and associated probability, and develop mitigation strategies. Opportunities will be managed as well to ensure project success and efficiency.

4.9.1.1. Project Background

Liberty Global or FLOW is in the process of upgrading its radio access networks in all Caribbean territories where it operates. Liberty Global and Ericsson have extended their partnership, as Liberty Global aims to consolidate and optimize its network services across the region. Ericsson promises that its service delivery will allow Liberty Global to improve network availability and stabilization, enhancing end user experiences for the service provider's customers. In Saint Lucia, the aim of this project is to add LTE technology to 70 existing WCDMA/GSM sites. This would include the addition of or change of existing antennas, insertion of new routers and baseband units, adding more IP capacity on backhaul links, creating a new IP family for the enode B, and ensuring that all the sites operate at the prescribed benchmarks.

4.9.1.2. Approach

The LTE upgrade risk management methodology is based on the elements included in the PMBOK® Guide Sixth Edition. Risks associated with the project are examined and identified as early as possible to minimize their impact on project deliverables. Due to the schedule and cost constraints, the risk management meetings are held at least once a week. The steps for accomplishing the risk management plan are outlined in the following sections.

4.9.2. Project Constraints

The LTE upgrade project aspires to upgrade FLOW Saint Lucia's mobile network from 2G and 3G to 4G technology. As it is outlined in Chart 31, the project has several limitations to consider in the risk management process:

Chart 31. Project Constraints

Constraints	
Schedule	Project execution must be completed from September 2 nd , 2019 to January 14 th , 2020 to ensure 4G service is available island-wide before the start of the new financial year (March 2020)
Cost	The budget cannot exceed \$1 500 000.00.
Quality	All installations must comply with the design specifications. Any unauthorized implementation may lead to environmental, health, and safety issues, which will negatively influence the public image of FLOW and its customer base.

4.9.3. Roles and Responsibilities

In the course of the risk management process, stakeholders, with their various roles and responsibilities, are required to collaborate in the risk identification process from the early stages of the project. The following table summarizes the roles and responsibilities concerning the project's risk management plan.

Chart 32. Project Roles and Responsibilities

Roles	Responsibility
Project manager	The project manager has the overall responsibility for the preparation, establishment, and execution of the risk management plan; he is also responsible for ensuring the proper communication to stakeholders regarding risks and corresponding project performance.
Project team (environmental health and safety officer, accountant, network engineers, and field engineers)	Specific responsibilities, among others, may include the following: <ul style="list-style-type: none"> • Active participation in risk management meetings • Identifying risks • Supporting the risk manager & project manager in clarifying and documenting risks • Providing status updates on risk mitigation actions • Communicating the status to risk owners • Participating in the risk closure process
Risk manager	The risk manager supports the project manager and project team in preparing

Roles	Responsibility
	and executing the risk management plan.
Contractors	They are responsible for resolving/managing the risks related to their implementation activities and are to report newly identified risks to the project team immediately.
Network design architects	They are responsible for highlighting the inherent risks related to the implementation of the network design and must report newly identified risks immediately.
Sponsor	The sponsor defines constraints and requirements to ensure that they are considered as part of the risk management process.

4.9.4. Risk Management Process

4.9.4.1. Risk Identification

Section 4.9.3 describes the stakeholders' roles and responsibilities regarding the risk management plan. Project risk identification will be part of the weekly meetings to ensure ongoing revision and documentation. All assumptions made to identify risks are to be continuously reviewed and acted upon to ensure the uncertainties are well under control. Furthermore, the risk identification process will include all perceived hazards or opportunities pertaining to the project's implementation and after closure. Risks will be assigned codes in the risk breakdown structure, and a risk register will be prepared to include all risks (threats and opportunities) identified during the project lifecycle.

The project team and other relevant stakeholders will identify risks from the early stages of the project to be reviewed and evaluated by the project manager and team. The risk identification/management process will depend on the outcome of the stakeholders' risk workshops and the evaluation of similar projects in the nearby islands. The risk breakdown structure is used as a guiding tool in the workshops, along with lessons learnt from previous projects, brainstorming, and interviews.

4.9.5. Risk Breakdown Structure

The risk breakdown structure (RBS) is a hierarchical representation of potential risk sources. The project's RBS provides additional insight into the risk

exposure assessment that will be used in risk identification and prioritization processes (see Chart 33).

Chart 33. RBS for LTE Upgrade Project

Risk – level 1	Risk – level 2	Risk – level 3
External risks	1. Environment	1.1 Natural environment/weather
		1.2 Sites and facilities
		1.3 Legal (regulatory) and compliance
		1.4 Waste management
	2. Community	2.1 Government restrictions (VISA implementations)
		2.2 Worldwide pandemic
2.3 Societal concerns/requirements		
Internal risks	3. Organization and management	3.1 Schedule and resource constraints
		3.2 Financial constraints
		3.3 Management experience
	4. Personnel and material	4.1 Personnel experience and qualifications
		4.2 Personnel and material availability
		4.3 Quality of material resources
		4.4 Safety/Security requirements
	5. Design and engineering	5.1 Project design requirements
		5.2 Installation permits and conditions

4.9.6. Qualitative Risk Analysis

Through qualitative risk analysis, risk prioritization is assessed using the probability of occurrence, the results of which are included in the risk register. The risk and project managers, with input from the project team and other stakeholders, evaluate the probability and impact of occurrence for each identified risk. Probability and impact scales are defined in the following sections.

4.9.6.1. Probability Scales

The risk management plan identifies and administers risks (threats) and opportunities. Probability and impact scales are calculated for both situations based on various circumstances. The probability scales for the project are based on the likelihood of the risk happening within particular timeframes of the 97-day span of the project. The risk probability and impact scales used in the risk register are based on defining clear ratings and logical economic effects on the project.

Chart 34. Project Risk Probability Scale

PROBABILITY	
1	An event we don't expect to happen in the next 97 days
2	An event we don't expect to happen in the next 50 days
3	An event we expect to happen anytime

The project impact scales were aligned with project circumstances with regard to the economic impact and risk occurrence. The project budget is limited to \$1.5M, based on the fact that approximately 100 days of project duration (at 5 days a week, 8 hours a day) is equivalent to \$75 000 per week, \$15000 per day, and \$1875.00 per hour.

Chart 35. Risk Impact Scale

IMPACT	
1	Impact of less than \$150 000
2	Impact between \$150 001 and \$375 000
3	Impact higher than \$375 001

Risks that fall within the yellow and red zones will require risk planning, risk mitigation, and a risk contingency plan.

4.9.6.2. Project Opportunities

Probability and impact scales for the project opportunities are also defined considering cost savings, sponsor company prestige, and project quality.

Chart 36. Project Probability Opportunity Scale

PROBABILITY	
1	Project benefits will be sustained from 1 – 4 years.
2	Project benefits will be sustained from 5 – 9 years.
3	Project benefits will be sustained for more than 10 years.

The project's impact scales regarding the project opportunities are aligned with the sponsor's public image and prestige. Public image is related to the economical investment of the project.

Chart 37. Project Opportunity's Impact Scale

IMPACT	
1	Positive public image is translated into economical savings estimated at \$375 000.
2	Positive public image is translated into economical savings estimated between \$375 000 and \$1 500 000.
3	Positive public image is translated into economical savings higher than \$ 1 500 000.

4.9.6.3. Probability and Impact

Based on the project's objectives and sponsor's expectations, added to the lessons learnt in past projects and brainstorming among the stakeholders, the probability and index scales were defined in the chart below.

Chart 38. Risk Probability and Impact Result Scale

P x I (probability x impact)	
1 – 3	Green
4 – 6	Yellow
7 – 9	Red

Risks that fall within the yellow and red zones require risk response planning, which may include a risk mitigation and a risk contingency plan.

Chart 39. Probability of Opportunities and Impact Result Scale

P x I (probability x impact)	
1 – 3	Green
4 - 7	Yellow
8 - 9	Red

Opportunities that fall within the yellow and red zones are those that will be taken advantage of.

4.9.7. Risk Identification (Risk and Opportunity Register)

All risks and opportunities that may affect the project outcome or arise from the project assessment are documented in the project's risk register (log). The opportunity side of the register offers many benefits. It can offset risks, create a pool of money to serve as an incentive pool for the team to enhance profits, or act as a funding source to drive additional value to the project. Often, teams are too focused on risks that they fail to consider them as opportunities. Having an actively

managed risk and opportunity register encourages project teams to look for and consider opportunities that can enhance the value of the project. Finally, the register provides an effective tool for sharing knowledge. Everyone on the team contributes and views information contributed by others. The register is also the basis for weekly risk management. At the end of the project, the register provides teams with a record of how risks were managed and how the gains were realized through the process for the client and the individual partners.

The risk and opportunity register was prepared based on the proposed activities expected for this type of project, constraints, and conditions. Prioritization was based on their likelihood of occurrence and degree of potential impact. Updates to the register will be performed on a weekly basis due to the compromised project schedule and the criticality of the project.

Chart 40. Risk Register

RBS code	Cause	Risk	End result	P	I	P x I	Trigger	Owner	Strategy	Cost
1.1	The peak of the annual hurricane season is between Sep & Oct.	Damage to poorly maintained site access routes, lightning strikes at high elevations, flooding in low regions, and high winds preventing climbing towers	Interruptions in the outdoor hourly based project activities	3	3	9	Stormy weather, heavy rains, and high winds	PM	Mitigate. To have a functional hurricane preparedness plan To follow the national weather forecast To avoid going to remote locations on rainy days and not climbing towers in bad weather	In case of very poor weather, days of work will be lost. This may imply working on weekends to catch up, which is twice the daily rate: \$150 000. Fast-tracking and crashing are also options with additional costs.
1.2	Some sites are in remote, difficult terrain areas that require hours of hiking.	Certain hiking routes are in poisonous snake territories. Contractors need to wear adequate protective clothing.	Contractors may be stung by snakes	1	2	2	The contractor inadvertently coming into contact with a snake	PM	Mitigate. To ensure contractors are properly attired when heading out to remote sites, contractors know what hospitals to go to for attention in case of a snakebite. Transfer: To get health insurance for contractors	To provide each team of contractors with adequate safety equipment (\$10 000) and have contractor health insurance for the duration of the project \$100 000
1.3	Random inspections for wireless telecom regulation compliance	To ensure that new installations operate within specified frequency ranges and transmission limitations	Inspection failure	2	3	6	Random local regulatory body inspection	PM/Field engineers	Accept. To ensure that installations are done to the standards	An inspection failure carries a \$150 000 cost plus additional labour/costs to rework the site.
1.4	Implementation waste material not disposed of properly	In the present climate of cooperate social responsibility, this would be a public scandal for the customer.	The customer's brand may be negatively impacted.	3	3	9	The project team overlooking that responsibility	PM	Accept & Transfer: To acquire a local team to perform the task, it is the responsibility of the field engineers to ensure the completion.	A clean up contractor may be sourced for \$100 000.
2.1	Due to the destabilization in Venezuela, millions have left the country to get to the Caribbean. The prime minister of SLU is considering implementing VISA restrictions on Venezuelan nationals.	The implementation contractors are teams chosen from Venezuelan companies. This sudden travel change will affect the number of contractors on the ground.	The expected compliment of contractors will not be available for the duration of the project.	2	2	4	Unexpected development	PM/Procurement manager	Accept: To train local field service staff in all field implementation requirements	Based on the competencies of the field staff, one week of training is required. The cost is \$25000.
2.2	News agencies are reporting increasing numbers of deaths from a new disease, Covid-19. Countries are beginning to close their borders.	Foreign contractors working on the project may be required to leave the country if the disease gets to the Caribbean before the project is complete.	The project may have to be shut down – incomplete.	2	3	6	The disease being discovered in the Caribbean region	PM/Project sponsor	Accept: Teams will have to work longer hours and on weekends to complete the fieldwork aspect of the project.	Overtime: 1.5 x hourly rate Work on Sundays and holidays: 2 x hourly rate (fast-tracking or crashing certain activities)
2.3	Whilst working at a site of a prominent hotel property, 8 Venezuelan contractors went to the hotel staff canteen and ordered meals.	These *8 contractors could have been dismissed immediately and sent back home on the next available flight, and the customer could have asked for the project to be put on hold.	The 8 contractors were docked one week's pay, and the customer allowed the work to continue.	3	3	9	The contractors ignored the advice on local customs.	PM	Accept. Mitigate. To reinforce the requirement to behave responsibly with the local contractors.	Ericsson may have had to pay for legal services, had Hotelier been uncompromising: \$50 000.
3.1	A delay in the arrival of project material and hardware	A delay in implementation works, resulting in the schedule being lengthened	Ericsson being charged for failure to meet the target schedule	2	2	4	A delay in shipping due to various reasons	PM/Procurement manager	Avoid. Mitigate. To ensure that persistent and regular checks are done on shipping status, delivery dates, etc. To have a plan B – that is a database of spare equipment from other islands in the region, in case any of the ordered material is delayed	The charge for late delivery of the project is \$250 000. Extra costs will also be incurred if the PM decides to "crash", i.e. reduce the time of completion of the tasks in the critical path.
3.2	Difficulties in getting project funds transferred to local	Contractors cannot access the funds needed to purchase	Contractors cannot work on schedule	2	2	6	Guidelines implemented by the Regional Banking	PM, legal authority, accounting, and	Avoid. Mitigate. To reach a compromise with the customer to have	The charge for late delivery of the project is

RBS code	Cause	Risk	End result	P	I	P x I	Trigger	Owner	Strategy	Cost
	banks	tools locally, pay for house and vehicle rentals, etc.	until money issues are resolved.				Regulatory Committee to combat international money laundering	procurement	a cash float on the island until all project monies have been transferred to local banks To ensure that Accounting and Legal are aware of the requirements to transfer to local banks	\$250 000.
3.3	The project manager has not worked in the region and does not understand the culture	Contractors instructed to carry out activities that may cause embarrassment for the customer, e.g., going to sites without informing beforehand	The customer's brand being affected negatively	1	1	1	PMs with regional experience not available for the project	Project sponsor	Avoid. To ensure that the PM has previous experience working in the region	An inexperienced PM can cause many issues with the delivery of the project. The charge for late delivery of the project is \$250 000. This will also negatively affect the Ericsson brand.
4.1	Contractors are not as experienced and qualified as they claim.	Inferior quality workmanship and accidents on site	Failures on project audits, accidents, etc.	1	2	2	Resource ratification process not done	PM, procurement manager, and human resources	Avoid. To ensure that the resource ratification process is carefully done	Inexperienced and unqualified contractors can mightily cost the project and negatively impact Ericsson's brand.
4.2	Contractors and/or hardware are not available for the required start of their activities.	The project may be delayed.	Project is delivered later than the agreed date.	1	1	1	Resource procurement process not effectively done	PM, project manager, and HR	Avoid. To ensure that the resource procurement process is adequately implemented. Mitigate. Depending on the tardiness of the equipment and/or resources, fast-track particular tasks	Project delays and inconsistencies will negatively affect Ericsson's brand. Postponement of the project delivery date due to those inconsistencies will incur charges. Fast-tracking or crashing certain activities to remain on schedule will also incur higher costs.
4.3	Material/hardware quality is not consistent.	Substandard quality material leads to audit failures, safety issues during installation, and below par network performance.	The entire project may be postponed if the equipment is found to be defective.	1	1	1	Ericsson ASPs did not deliver on the quality standards required of them. Materials are shoddy. Specifications were not met.	PM and procurement manager	Avoid: To ensure Ericsson's rigorous quality standards are maintained by all ASPs	Inconsistent quality hardware will damage the Ericsson brand and its relationships with ISPs all over the world.
5.1	Incomplete project design	The project cannot proceed.	Project starting time must be rescheduled.	1	1	1	The Ericsson design team did not complete the network drawings.	PM and project sponsor	Avoid. Ericsson's professional approach ensures that all stages of the project processes are delivered on schedule.	Inconsistent quality hardware will damage the Ericsson brand and its relationships with ISPs all over the world.
5.2	Installation permits were not obtained.	The project cannot proceed.	Project starting time must be rescheduled.	1	1	1	FLOW not being able to acquire permits for new site installations	FLOW HR and PM	Avoid. Mitigate. The PM works with customer's HR to ensure all necessary permits are received in a timely manner ahead of the project start date.	If permits are not received on time, the customer may have to pay Ericsson mobilization costs.

Chart 41. Opportunity Register

RBS code	Cause	Opportunity	Advantages	P	I	P x I	Trigger	Owner	Strategy
1.4	Waste management	Used/replaced equipment can be sold to other regions.	The material does not have to pile up at a dumpsite. Material reuse increases the cooperate social responsibility status of both Ericsson and FLOW	3	3	9	Used equipment collected, sorted, and stored	PM	Share: The equipment is handed over to a third party to seek potential buyers.
2.1	Government restrictions	Training of local Ericsson staff	The training of local staff in the tasks assigned to the contractors builds the competencies of the local Ericsson workforce.	3	3	9	Imposed Visa requirements for Venezuelan contractors will limit the number of contractors available for the project.	PM	Enhance. It reduces the cost of the project, since some of the qualified resources are now in-house.
4.1	Personnel experience and qualifications	Contractors are mainly Spanish speakers; working on the island aids their learning of a second language.	It makes it easier for the same contractors to be used in other English speaking islands.	2	3	6	Contractors have to interact with locals.	Procurement manager	Enhance: It improves the usability of the contractors.

4.9.8. Risk Response Planning

Project team members are assigned risks for monitoring and ensuring adequate management. For each mitigated risk, the project team will identify ways to perform risk monitoring, controlling, and reporting throughout the project lifecycle. To reduce the threats of specific risks to project objectives and take advantage of possible opportunities, the project team will develop appropriate action plans. All project change requests will be analyzed for their possible impact to the project risks.

4.8.9. Risk Monitoring and Control

Risk monitoring and control is the process of identifying, analyzing, and planning for newly identified risks, monitoring previously identified risks, and re-evaluating existing risks to verify the planned risk response strategies for their effectiveness. The updated risk register list will be maintained by the project team and will be reported as a component of the project status reporting process on a weekly basis.

Project activities involved in risk monitoring and control include the following:

- Validating risk mitigation strategies and alternatives
- Taking corrective action when actual events occur
- Assessing the impact of actions taken on the project (cost, time, and resources)
- Identifying new risks resulting from risk mitigation actions
- Ensuring that the project plan (including risk management plan) is maintained
- Ensuring change control addresses risks associated with the proposed change
- Revising risk management documents to capture the results of mitigation actions
- Updating the risk register

- Communicating risk management status and risk response follow-through as appropriate
- Establishing communication as appropriate

4.9.10. Risk Management Closeout

At the completion of the LTE upgrade project, the successful transition of any open risks and lessons learnt is important for project maintenance, support, and future project work. The following risk management activities are applied:

- Validation of the completion of identified risks. Documenting the remaining open risks and providing access to the final report.
- Producing final risk management metrics and evaluating process effectiveness against the established benchmarks
- Capturing risk factors and risk mitigation plans for inclusion in risk reference models (lessons learnt)

4.9.11. Sponsor Acceptance

By cosigning the following document, the project manager and project sponsor acknowledge that they have approved the risk management plan for the LTE upgrade project. Any changes to this risk management plan must be coordinated with and approved by the undersigned or their designated representatives.

Approver name	Title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

Revision History

Version	Date	Reason	Executive sponsor sign off

4.10. Stakeholder Management Plan

4.10.1. Introduction

The LTE upgrade stakeholder management plan identifies the approach to manage project stakeholders, stakeholder management roles and responsibilities, stakeholder identification, stakeholder analysis, and stakeholder management strategies, based on PMBOK guidelines.

4.10.1.1. Approach

The constraints of time, cost, and scope are essential for this project, requiring strategic communication throughout the project cycle. The project team will update and review the stakeholder registry when necessary to guarantee a motivated collaborator management strategy ensuring the engagement and satisfaction from all those involved.

4.10.2. Roles and Responsibilities

The stakeholder roles and their duties are summarized in the table below:

Chart 42. Roles and Responsibilities

Stakeholder – Role	Responsibilities
Project manager	<ul style="list-style-type: none"> • Initiating the development of the stakeholder management plan • Guiding initial stakeholder analysis • Completing the stakeholder management plan • Managing the schedule and activities related to stakeholder communication and engagement
Project sponsor	<ul style="list-style-type: none"> • Identifying stakeholders • Providing input in stakeholder categorization • Providing advice on preparation strategies included in the stakeholder management plan • Approving the stakeholder management plan • Being the leading role in representing the project to external stakeholders

Stakeholder – Role	Responsibilities
Project team	<ul style="list-style-type: none"> • Reviewing and providing advice on the stakeholder management plan • Assisting in the identification and classification of stakeholders • Assisting in the development of management strategies • Supporting stakeholder communication
NTRC	<ul style="list-style-type: none"> • Communicating telecom requirements/conditions to the project when necessary • Ensuring telecom standards are enforced, especially those regarding the environment and community safety
Network design team	<ul style="list-style-type: none"> • Providing relevant information for stakeholder communication • Ensuring frequent and effective communication regarding project issues
Contractors	<ul style="list-style-type: none"> • Providing information to support stakeholder communication • Ensuring frequent and effective communication towards project concerns
Field services	<ul style="list-style-type: none"> • Providing information to support stakeholder communication • Ensuring frequent and effective communication towards project issues

4.10.3. Stakeholder Management Processes

The project manager and his project team will perform the stakeholder identification and stakeholder analysis to define the corresponding management strategies. This process will provide the required information to manage the stakeholders for the entire project lifecycle.

4.10.3.1. Stakeholder Identification

A stakeholder register is the output of the stakeholder management processes that included several aspects, such as the project influence levels of each stakeholder, people that the project work affects, and their interests.

4.10.4. Stakeholder Analysis

The stakeholder analysis was prepared with the use of existing project documentation, such as the project charter, brainstorming techniques, and meetings. Determining the stakeholder influence and impact started since the initial project phases and will continue until project completion.

Chart 43. Project Stakeholder Analysis

Stakeholder	Project involvement	Interests	Aptitudes
Project manager	<ul style="list-style-type: none"> The project manager coordinates the deliverables and negotiates contracts with vendors. The project manager reports the progress and risks to the sponsor. He is responsible for the overall project planning and execution. He is authorized by the sponsor to perform all the necessary logistics required for the execution of the project. 	Successful project completion within schedule, cost, scope, and desired quality	Knowledge, interpersonal skills, and experience
Project sponsor	<ul style="list-style-type: none"> Approval of the project charter and all deliverables 	Project success	Financial support
Project team	<ul style="list-style-type: none"> The project team prepares all the required documentation. The project team executes the required tasks to achieve project deliverables. 	Project success	Knowledge and experience
The National Telecom Regulatory Commission (NTRC)	<ul style="list-style-type: none"> It provides general requirements and conditions necessary for the viability of the project. It approves permits and provides endorsement. It inspects/evaluates the project execution. 	To ensure that the regulatory processes are followed	Their approval is critical for project execution.
Network designers	<ul style="list-style-type: none"> They are responsible for preparing a design in accordance with telecom and environmental codes and environmental regulations. 	Project success and regulation compliance	Knowledge and experience
Contractors	<ul style="list-style-type: none"> They are responsible for site installation/implementation in accordance with network design specifications on schedule and within budget. 	Project success	Knowledge and experience
Mobile customers	<ul style="list-style-type: none"> They alert of receiving new services. 	Project success	To be informed of the possibilities of utilizing the

Stakeholder	Project involvement	Interests	Aptitudes
			new technology

Regarding the project, stakeholders can be differentiated into 4 categories:

- High influence/High interest
- High influence/Low interest
- Low influence/High interest
- Low influence/Low interest

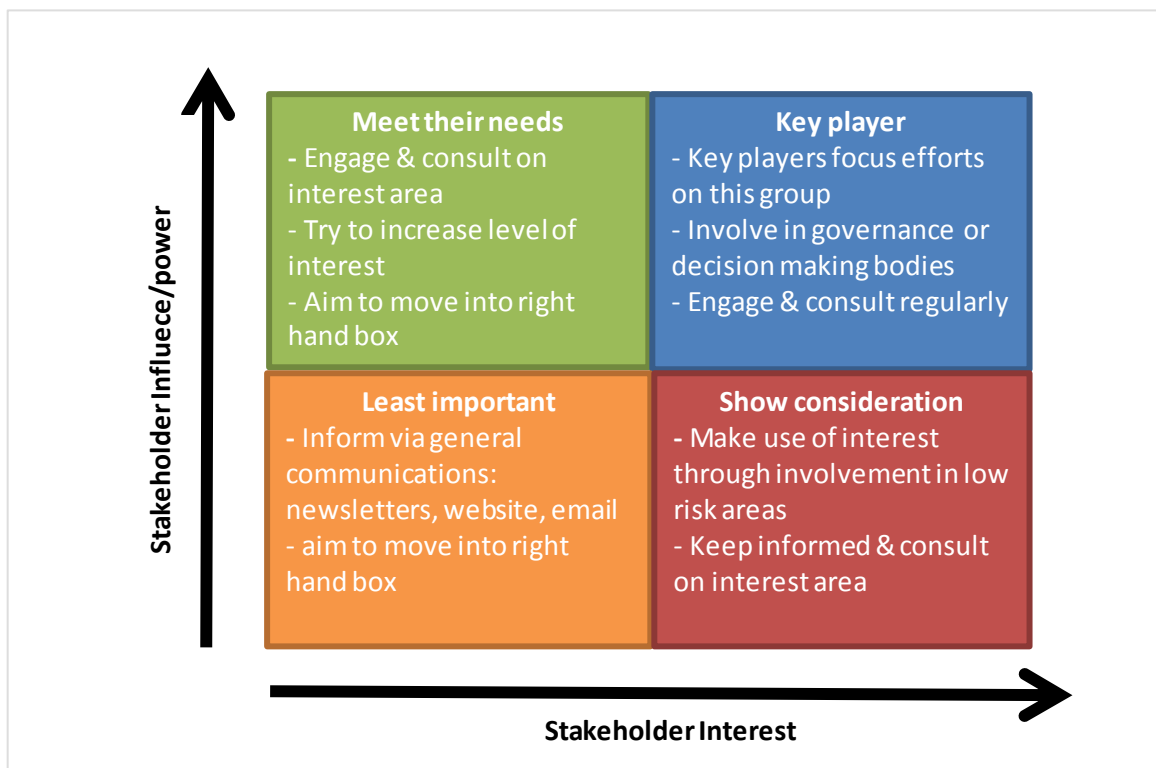


Figure 25. Stakeholder Influence/Interest Model

The most critical stakeholders are members of the high interest/high influence category. The analysis of the stakeholders will be executed with the use of expert judgment, lessons learnt, brainstorming techniques, and the results included in the stakeholder registry.

Chart 44. Stakeholder Influence

ID	Stakeholders	Roles/Responsibilities	Main expectations	Major requirements	Influence/Impact
1	Project sponsor	<ul style="list-style-type: none"> To ensure resources are available To promote the project Overall responsibility for project success 	<ul style="list-style-type: none"> The project completed within budget and on schedule 	<ul style="list-style-type: none"> That all conflicts/issues are professionally handled To be frequently updated on the project's progress 	High impact/High influence
2	Administrative project team	Subject matter experts (accounts, HR, legal, scheduling, and networks)	To adequately support the project manager to enable the project success	Tasks are communicated in an elucidative manner and are completed as expected.	High impact/High influence
3	Engineering project team	Subject matter experts (IT, RF, core network, and R.A.N.)	To ensure the project is executed per project specific design and compliance laws, within schedule and budget	Tasks are communicated in an elucidative manner and are completed as expected.	High impact/High influence
4	Installers	Implementation experts	Commitment to complete the works on schedule and cost	Tasks are completed as designed and with agreed quality.	Low impact/Low influence
5	Government agencies	Government representation	To represent the government, the wide community, and environmental interest	An evaluation of all regulations and conditions prior to the project start	High influence/Low impact
6	Telecom	Inspections and regulatory	To certify that the	Tasks are to be clearly	Low influence/High

ID	Stakeholders	Roles/Responsibilities	Main expectations	Major requirements	Influence/Impact
	regulatory authority (non-governmental agency)	compliance	project is executed according to the established codes and regulations	communicated to ensure that they are completed as expected. Drawings and specifications are to be provided in advance.	impact
7	Network designers	Subject matter expert	Network design architecture including all stipulations, codes, regulations, and considerations for project success	The project design must comply with all telecom, environmental, health, and safety concerns	High influence/High impact
8	Local Ericsson employees	Project participants	Ericsson quality standards	For communication processes to be transparent	High influence/Low impact
9	Material suppliers	Suppliers	To provide the materials as expected – on time, as specified, and with the expected quality	To receive design material specifications in time to ensure availability and quality	Low influence/Low impact
10	Contractors	Contractors	Transparent bidding process and clearly defined activities	Transparent bidding process, providing experienced and knowledgeable installers	High influence/Low impact

4.10.5. Stakeholder Management Strategies

Stakeholder documentation regarding communication method, frequency, message, and motive is necessary to ensure that the requisites are communicated, understood, and attended to as planned.

4.10.6. Execution of Management Strategies

This stakeholder management plan will be reviewed when:

- There are events requiring information to be sent to stakeholders
- There are tasks related to the preparation and review of materials to support the events and other communication activities
- There is a need for capturing input gathered from stakeholders
- There is a need to follow-up on situations to incorporate the input into project assessments
- Other situations, where applicable

4.10.7. Sponsor Acceptance

The undersigned acknowledge that they have reviewed and approved the stakeholder management plan for the LTE upgrade project. Changes to this stakeholder management plan will be coordinated with and approved by the undersigned or their designated representatives.

Approver name	Title	Signature	Date
Alexander French	Project sponsor		
Sean Lewis	Project manager		

Revision History

Version	Date	Reason	Executive sign off

CHAPTER V. CONCLUSIONS

Ericsson views the most critical aspect of project success as the ability to meet the customer's expectations. Ericsson's approach to project management leads one to expect a successful project delivery because the emphasis is on managing the five constraints of time, cost, quality, scope, and risk. Ericsson views project success as providing stakeholder value in the form of business results.

The customer, C&W communications, is one of the largest full service communication and entertainment providers in the Caribbean and Latin American regions. C & W is now part of Liberty Global, and in 2016, it collaborated with Ericsson for 3G and 4G LTE expansion across its operations in the Caribbean and Panama.

The expansion includes hardware, software, licensing, and services for C&W brands.

This Saint Lucia LTE project upgrade was a tiny fraction of the total regional expansion; however, it permitted the author to be an active participant and observer in the processes leading to project success.

Regarding the project objectives, here are the following summations:

1. The integration management plan illuminates Ericsson's competitive advantage in aligning its project management and business strategies by creating and managing the correlations between focusing on customers and service providers. The formation of the project charter grants Ericsson and Liberty Global a formal way to share a common understanding of the project's purpose, timeframe, deliverables, risks, assumptions, boundaries, and responsibilities, and being approved by the sponsor, it imparts the significance that the project requires to be managed and executed successfully. Leveraging experience, best practices, and especially lessons learned in the integration management plan will support Ericsson's administration oversight to cut costs and sidestep risks in projects, enabling Ericsson to continue to implement stronger project management practices and processes in upcoming ventures.

2. Ericsson's scope management policy focuses on determining and documenting what is and is not part of the project scope. Additionally, Ericsson's change management procedures regard change as anything that influences projects, tasks, processes, structures, or even job functions. Appropriate scope management contributes to a positive influence on the customer's expectations, cost variances, schedule variances, team morale, resource management, and overall project success. This scope management plan exemplifies Ericsson's vast experience regarding scope change processes, requirements, limitations, and the accountability of the project manager and project sponsor regarding any change approval.
3. This project is time-sensitive; thus, acknowledging the critical path activities and the schedule cost baseline are two major utilities of the schedule management plan. The project manager is able to measure the project's progress against a formal baseline to ensure the appropriate monitoring and management throughout the project lifecycle.
4. The cost management plan estimates, allocates, and assists in controlling the project costs using the cost baseline. The project manager and project team will be able to measure and report the project progress against a formal guideline throughout the project lifecycle.
5. The quality management plan defines and codifies the standards that the project must meet to be considered successful and how these standards will be achieved and confirmed. The project manager and project team consider quality planning during project planning because it influences costs and scheduling. Quality planning determines the scope of what is to be measured, what metrics will determine project success, and how these will be satisfied from the beginning to the end of the project.
6. The Saint Lucia LTE upgrade project was part of a larger regional project. This meant that either many of the network design resources were virtually responsible for multiple islands simultaneously and/or some of the contractors had just finished projects in other islands before they began to work in Saint Lucia. Therefore, it was important that proper human resource management be

in effect to boost the performance of the project team. The teams' competencies were recognized and utilized to organize and evaluate their performance.

7. The project communication plan assisted in keeping the project on track, within budget, and aligned with C&W's expectations by annotating who would be communicated with whom, when, and how. The use of present day technology, smart phones, tablets, Wi-Fi and 4G LTE, and the ability to virtually group members, made the sharing of photos, videos, and other relevant information an instantaneous process. The project communication plan allowed the project manager to maintain control of the project and ensure all stakeholders received the necessary information.
8. Ericsson's many years in the delivery of projects has reinforced their need to properly plan for risk management. During their four-year stay in the region, they have witnessed firsthand the damages caused by hurricanes, tropical storms, and very heavy rains resulting in millions of dollars in infrastructure damage. The risk management plan encompassed a contingency budget, molding pre-determined responses to problems and opportunities, the lessons learned to be shared with future projects, and lastly, due to the proper managing of unforeseen risks, an increase in the return on investments.
9. Ericsson adheres to the labor standards, such as freedom of association, forced labor avoidance, fair employment conditions, and elimination of discrimination, and contributes to the sustainable development of society and anti-corruption. Ericsson requires the suppliers and its subcontractors to comply with the code of conduct. The procurement management plan helps in identifying the human resources, the goods and services needed for the successful project completion, the complete list of purchase orders and related supplier issues, and timelines and methods regarding delivery.
10. Project management is a collaborative effort that extends to the management of the organization, project team, contractors, vendors, and government and non-government ministries, all working together on a project. This stakeholder management plan emphasizes the relationship between the organizations,

FLOW & Ericsson, the project team, procurement teams and contractors, and government and non-government ministries, in executing the project deliverables and improving the project performance. The stakeholders' management plan provides the project manager with the methodology to ensure the stakeholders are effectively involved in project decisions and execution throughout the lifecycle of the project. Additionally, the stakeholder management plan helps to gain support for the project and anticipate resistance, conflict, or competing objectives among the project's stakeholders.

CHAPTER VI. RECOMMENDATIONS

The Ericsson network division is defined as the hardware, software, and related service offerings, both for radio access and transport, focusing on service providers. Ericsson's network technology enables the evolution to higher technologies through a natural, stepwise implementation – one that balances investment, new revenue streams, and competitiveness. Ericsson values each project as a non-recurring, time-limited, and budgeted commitment entity, and the aim is to provide the most value every time. The company recognizes that the collaboration with its partners, listening to their needs, and acting in their best interests is what is expected.

Regarding the Saint Lucia LTE upgrade, Ericsson completed the project on time and within budget despite the days lost to heavy rains, the challenges faced when the government of Saint Lucia instituted the VISA requirements on Venezuelan nationals and the Covid-19 worldwide pandemic. The customer, FLOW Saint Lucia, is pleased with the final product and is enjoying island-wide LTE technology with a better customer experience than that of the competition.

1. Ericsson highlights three key benefits of its approach to project integration management: a faster time-to-market due to its global experience leading to shorter project lead times, bringing networks to life as fast as possible; additionally, their holistic deployments utilizing a single point of contact to manage the complexities of the project on the service provider's behalf; and an enhanced user experience, since network service disruptions are minimized through the careful management of all elements that can have an impact and are presented to the customer regarding the project proposal.
2. Ericsson regards itself as a sustainability pioneer and has made long-standing commitments to reduce risks and create positive impact through their operations, the way they conduct business, the products and solutions they deliver, and society's use of Ericsson technology. This project saw the use of minimal resources to bring the project from initiation to close. Ericsson not only

considers the traditional project management approach of managing time, cost, and quality but also managing social, environmental, and economic impacts.

3. Ericsson employs a proactive management stance on topics relating to climate action and the environment as a core component of its sustainability strategy by leveraging the circular economy approach in everything they do.
4. Ericsson's approach to the cost, quality and resource, and procurement management processes of the project is centered on their use of the circular economy where the energy efficiency of its products, sustainable material management, reuse, and recycling are key areas.
5. Ericsson's circular economy is based on three key areas: design for excellent energy performance, making sustainable material choices that enable a high level of recycling and avoid the use of hazardous substances; investing significant time and effort in developing innovative solutions to help their customers improve energy operational performance; and a re-use/recycle strategy entitled Ericsson Global Product Take-Back Program, which ensures that products at the end of life stage are recycled.
6. Ericsson projects employ sustainable resource management by utilizing resources in a format that does not deplete or abuse.
7. Ericsson recognizes the use of "environmental communication" in its project planning and execution. Environment communication is referred to as the missing link between the subject matter of environmental issues and the related socio-political processes of policymaking and public participation.
8. Ericsson utilizes sustainable procurement in that it considers social and environmental factors alongside financial factors in making procurement decisions.
9. Ericsson includes climate change and the onset of disruptive technologies as considerations for its risk management plans.
10. Ericsson realizes that a well-managed stakeholder engagement process helps the project stakeholders to work together to increase comfort and quality of life while decreasing negative environmental impacts and increasing the economic sustainability of the project.

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- <https://libguides.newcastle.edu.au/researchmethods>
- <https://www.ericsson.com/en/portfolio/networks/network-services/network-roll-out/project-management>
- https://shodhganga.inflibnet.ac.in/bitstream/10603/73387/13/13_%20chapter%204.pdf
- <https://umb.libguides.com/PrimarySources/secondary>
- <https://www.arraspeople.co.uk/camel-blog/project-management/project-management-101-objectives-and-deliverables/>
- <https://www.cwc.com/live/news-and-media/press-releases/cwc-ericsson-deliver-world-class-mobile-broadband.html>
- <https://www.cwnetworks.com/about-us/>

<https://www.gfdrr.org/sites/default/files/publication/pda-2014-saint-lucia.pdf>

<https://www.slideshare.net/joh5700/what-are-information-sources-23796587>

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APPENDICES

Appendix 1: FGP Charter

PROJECT CHARTER	
It 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.	
Date	Project name:
January 20 th , 2020	Project Management Plan for the Updating of the FLOW Saint Lucia Radio Access/Mobile Network to the Long Term Evolution (4G) Technology and for Building Four New Sites in Saint Lucia
Knowledge areas / Processes	Application area (sector / activity)
Knowledge areas: project integration management, project scope management, project schedule management, project cost management, project quality management, project resource management, project communication management, project risk management, project procurement management, and project stakeholder management Process groups: initiating process group, planning process group, executing process group, monitoring and controlling process group, and closing process group	Telecommunications / Technology upgrade
Start date	Finish date
January 20 th , 2020	June 25 th , 2020
Project objectives (general and specific)	

General objective:

To create a project management plan, framed within the standards of the Project Management Institute, to manage the technology update of a radio access network in Saint Lucia

Specific objectives:

1. To create a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project and to produce the project management plan
2. To create a scope management plan to ensure that it includes all the work required to successfully complete the project
3. To create a schedule management plan to support the development and management of a project schedule to ensure the project is completed within the time constraints
4. To create a cost management plan to define the processes for developing and managing the project budget to ensure the project is completed within the budget constraints
5. To develop a quality management plan to identify the quality requirements for the project in order to ensure results meet expectations for approval within the time, cost, and scope constraints
6. To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within the schedule, budget, and agreed quality
7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information
8. To create a risk management plan to identify and examine risks to the successful completion of the project and further, develop plans to minimize the prospects of those risks
9. To develop a procurement management plan to be used to obtain products and/or services necessitated by the project
10. To develop a stakeholder management plan to identify, support, and ensure the effective engagement of the project stakeholders

Project purpose or justification (merit and expected results)

<p>In St Lucia, FLOW's competitor, through aggressive marketing strategies, has a larger customer base, but it has not improved its mobile network to the LTE technology. To pioneer the deployment of LTE, the market catalyst will be that which brings in the younger, technology-oriented customer to the FLOW service, which implies increased revenues and eventually, higher profits. LTE means higher network capacity and improved cost efficiency for FLOW whilst offering higher bandwidth, quicker upload and download speeds, and improvements in the mobile products and services offered to FLOW's customers. This project is an attempt to articulate and document the methodologies to be used to ensure that the project is implemented using the best practices identified by the Project Management Institute in the Guide to the Project Management Book of Knowledge (PMBOK).</p> <p>The project manager and project management team rationalize the significance of the planning process and the project management plan for the successful completion of the project. The project manager, throughout the duration of this project, will develop the project management plan ancillaries for the network upgrade to meet the constraints of cost, schedule, and quality.</p>
<p>Description of product or service to be generated by the project – project final deliverables</p>
<p>The project management plan for the network upgrade will be generated by this project. This plan will consist of all the subsidiary documents of a project management plan.</p>
<p>Assumptions</p>
<ol style="list-style-type: none"> 1. This project can be completed in three (3) months. 2. This project can be executed by one (1) person. 3. The individual executing the project has gained the required knowledge. 4. There are tutors available to provide guidance when required.
<p>Constraints</p>
<p>Time: three (3) months Resource: single individual</p>
<p>Preliminary risks</p>
<ol style="list-style-type: none"> 1. If a milestone is missed, this may affect the delivery of the project within the scheduled time. 2. If the assistance from the tutor is not timely, this may affect the delivery of the project within the scheduled time.
<p>Budget</p>

The budget will be constituted of financial resources required to pay to complete the remainder of the course plus additional funds to print, bind, and ship the final graduation project to Costa Rica.

Milestones and dates

Milestone	Start date	End date
Project start	February 24 th , 2020	February 24 th , 2020
Project charter	February 27 th , 2020	March 1 st , 2020
WBS	February 28 th , 2020	March 1 st , 2020
Chapter 1: Introduction chapter	2 nd March, 2020	6 th March, 2020
Chapter II: Theoretical Framework	9 th March, 2020	13 th March, 2020
Chapter III: Methodological Framework	16 th March, 2020	20 th March, 2020
Annexes, bibliography, and schedule	2 nd March, 2020	20 th March, 2020
Graduation seminar approval	23 rd March, 2020	27 th March, 2020
Tutoring	30 th March, 2020	1 st April, 2020
Previous chapter adjustments	2 nd April, 2020	8 th April, 2020
Chapter IV: Development (results)	9 th April, 2020	12 th June, 2020
Chapter V: Conclusions	15 th June, 2020	19 th June, 2020
Chapter VI: Recommendations	22 nd June, 2020	26 th June, 2020
Tutor approval	26 th June, 2020	26 th June, 2020
Reviewer assignment request	29 th June, 2020	3 rd July, 2020
Assignment of two reviewers	29 th June, 2020	30 th June, 2020
Communication	1 st July, 2020	2 nd July, 2020
FGP submission to reviewers	3 rd July, 2020	3 rd July, 2020
Review	6 th July, 2020	17 th July, 2020
Adjustments	20 th July, 2020	14 th August, 2020
Presentation to the board	17 th August, 2020	21 st August, 2020

Relevant historical information

The project manager has been employed within the telecom industry for the last 12 years. For the past 12 months, he has been a dedicated student of the Universidad de Cooperación Internacional's MSc program management virtual classroom.

Stakeholders

Direct stakeholders:

- FGP lecturer: Professor Carlos Brenese
- Project manager: Horace Popo

Indirect stakeholders:

- Academic assistant: Gabriela Zuniga

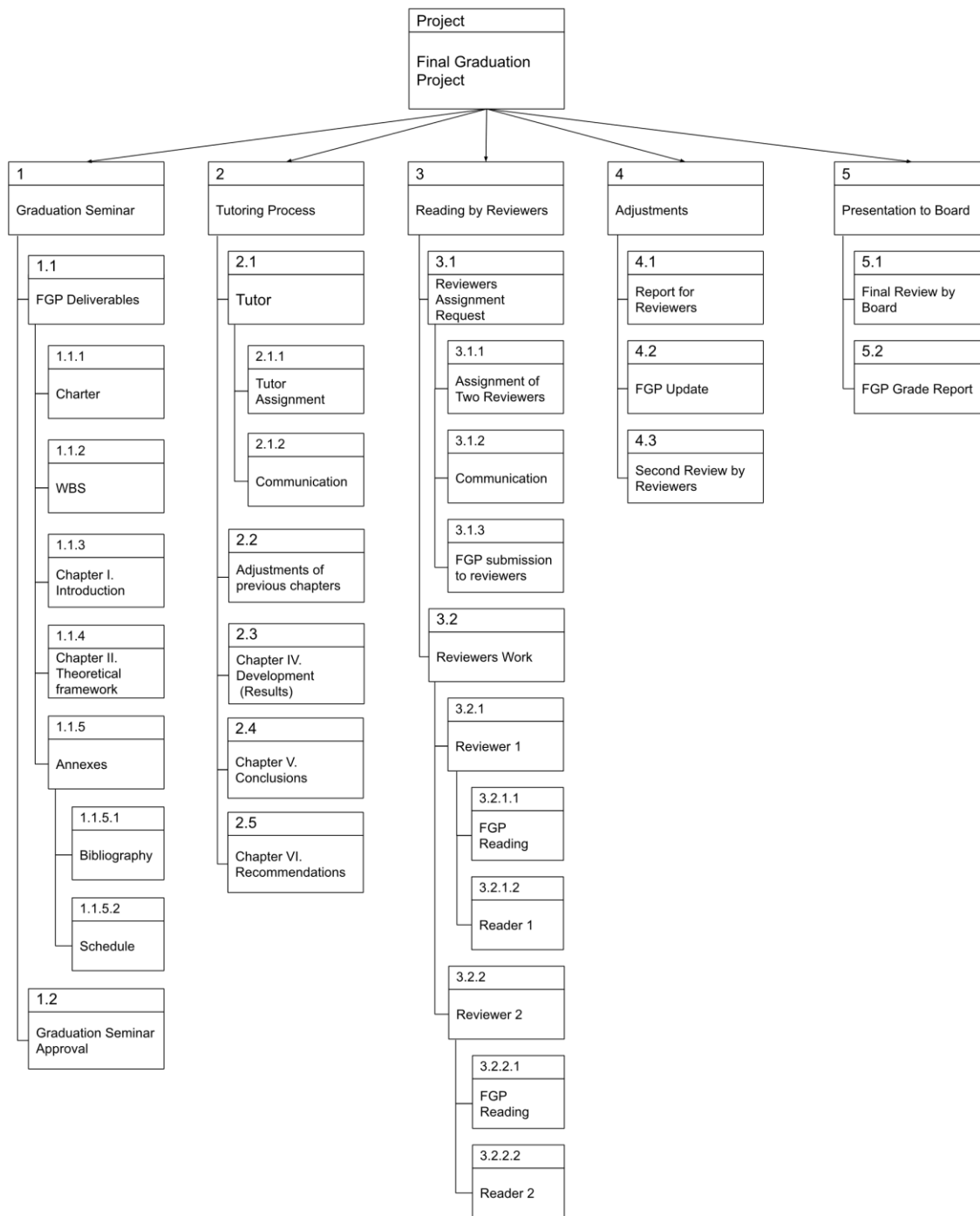
Project manager:

Signature:

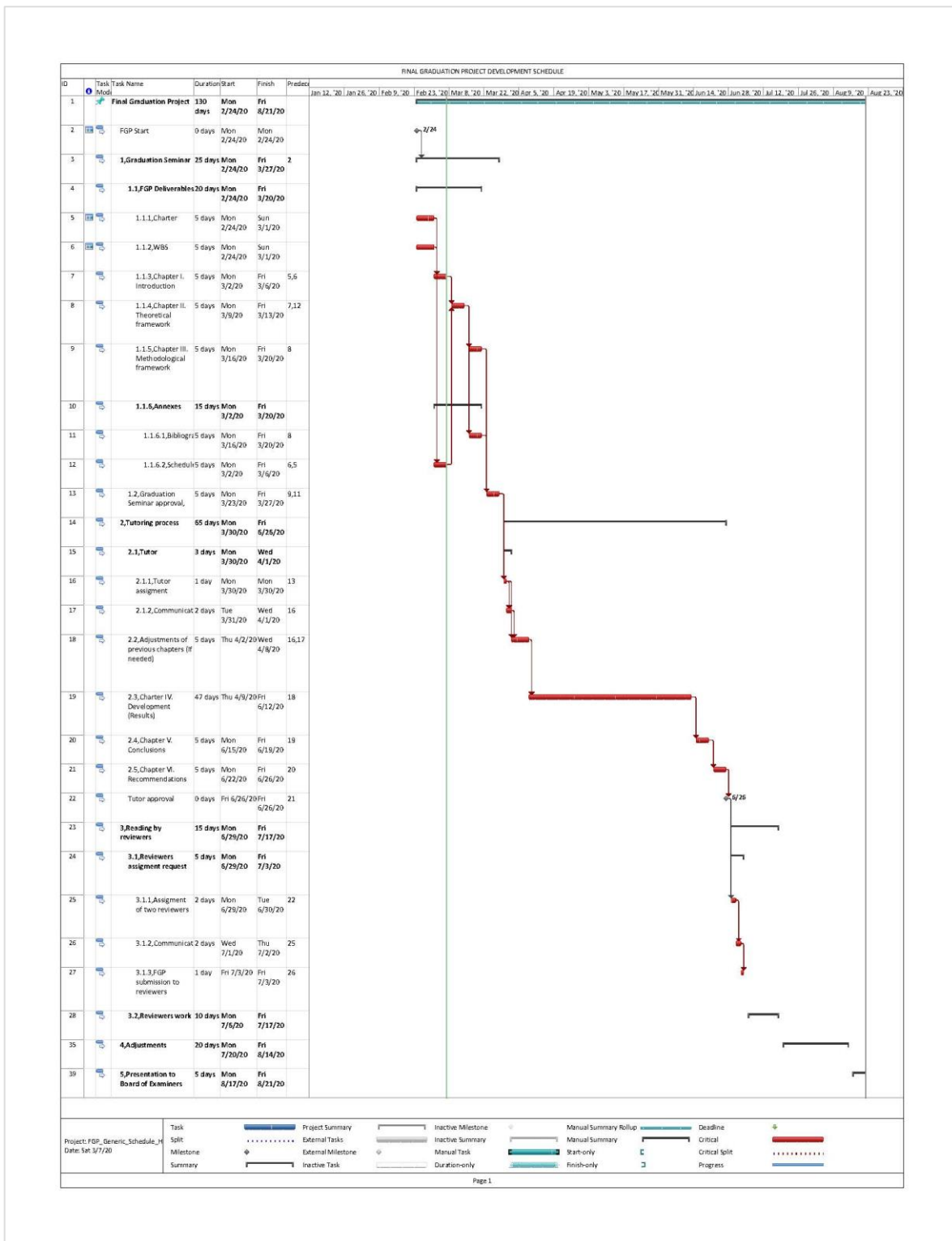
Authorized by:

Signature:

Appendix 2: FGP WBS



Appendix 3: FGP Schedule



FINAL GRADUATION PROJECT DEVELOPMENT SCHEDULE																							
ID	Task Name	Duration	Start	Finish	Preced	Jan 12 '20	Jan 26 '20	Feb 9 '20	Feb 23 '20	Mar 8 '20	Mar 22 '20	Apr 5 '20	Apr 19 '20	May 3 '20	May 17 '20	May 31 '20	Jun 14 '20	Jun 28 '20	Jul 12 '20	Jul 26 '20	Aug 9 '20	Aug 23 '20	
42	FGP End	0 days	Fri 8/21/20	Fri 8/21/20	41																		8/21

Project: FGP_Generic_Schedule_H Date: Sat 3/7/20	Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
	Split	External Tasks	Inactive Summary	Manual Summary	Critical
	Milestone	External Milestone	Manual Task	Start-only	Critical Split
	Summary	Inactive Task	Duration-only	Finish-only	Progress

Page 2

Appendix 4: Other Relevant Information

- <https://stluciatimes.com/saint-lucia-cites-threat-from-internal-breakdown-in-venezuela/>
- <https://www.ectel.int/wp-content/uploads/2015/12/SLU-59-2014-exemption-order.pdf>

Appendix 5: Site Installation Data (One Site)

Project: **ST. LUCIA C&W FLOW AOP 2019**
 Site name: **SLU205 SLU_BAY_WALK_MALL**

1 GENERAL

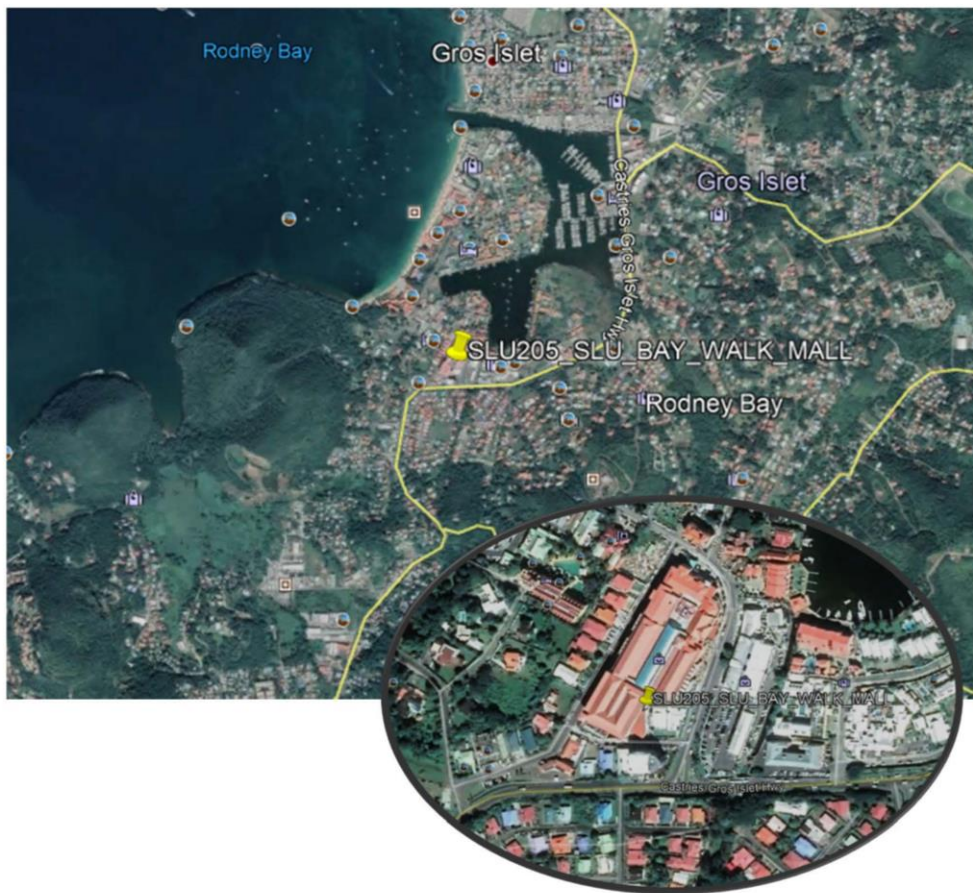
1.1 Coordinates Long: -60.95471000
 Lat: 14.06861000

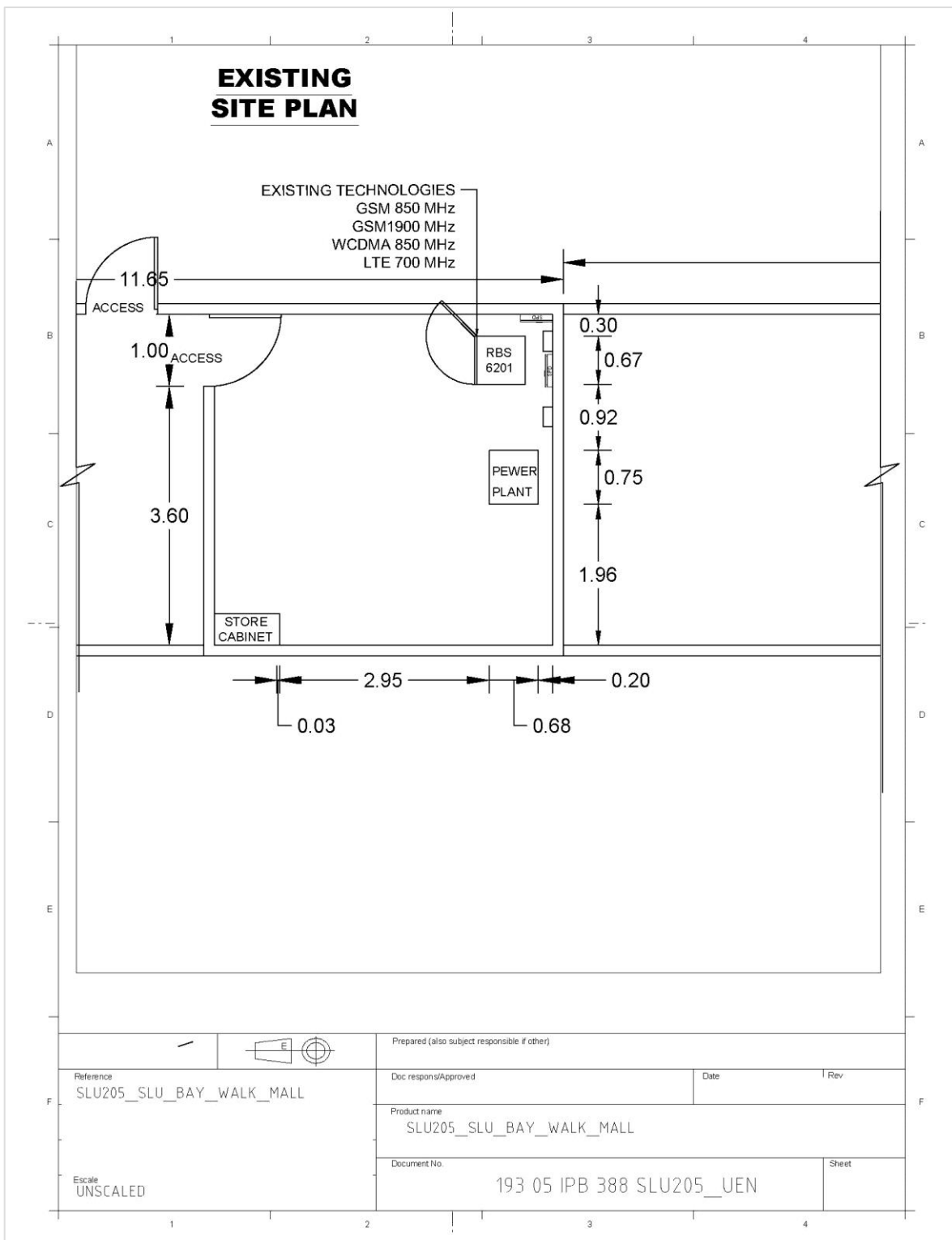
1.2 Location: Gros Islet, St. Lucia

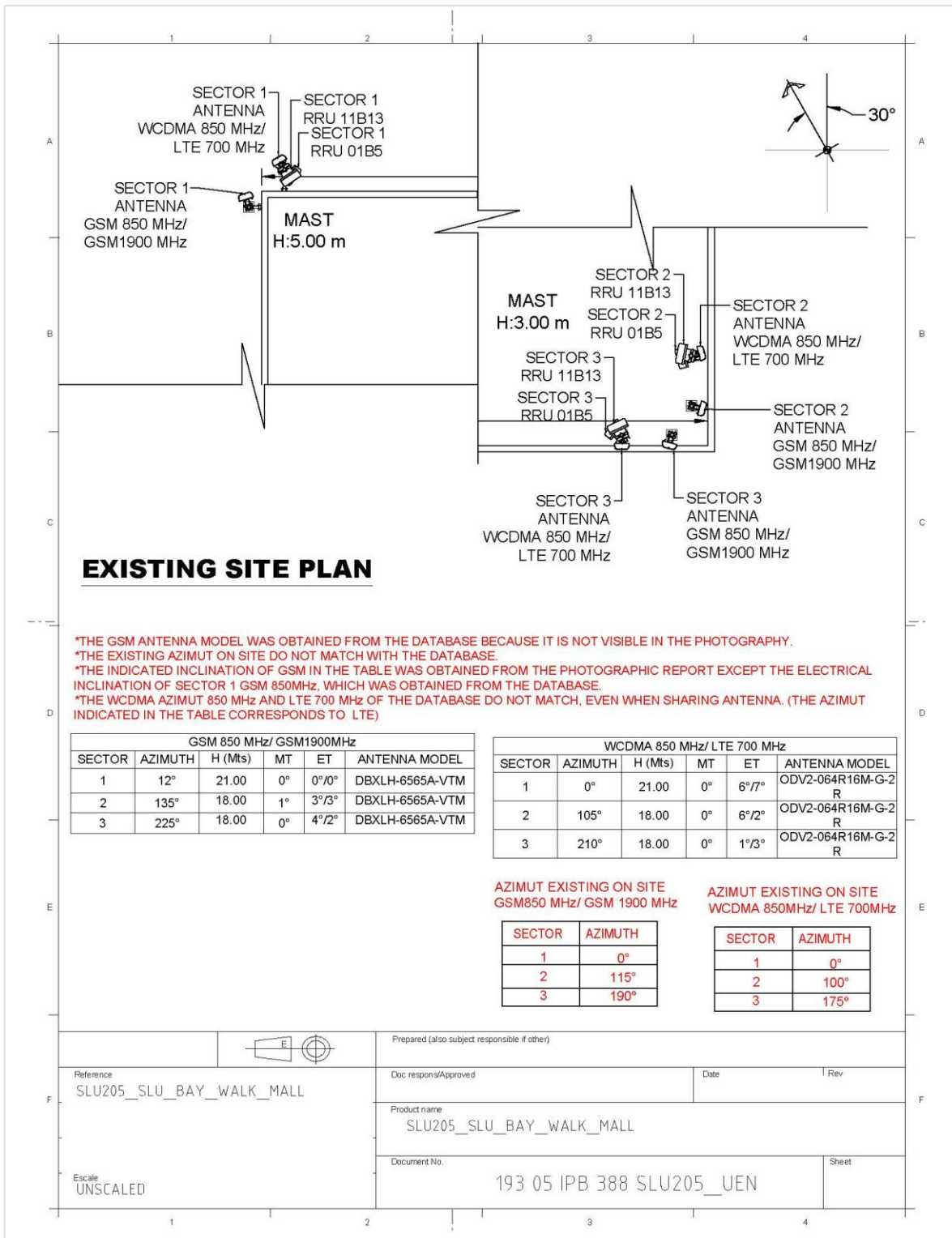
1.3 Type of building Rooftop - Wall Mounted

1.4 ML TN Placed on: N/A

1.5 SITUATING PLAN







EXISTING SITE PLAN

*THE GSM ANTENNA MODEL WAS OBTAINED FROM THE DATABASE BECAUSE IT IS NOT VISIBLE IN THE PHOTOGRAPHY.
 *THE EXISTING AZIMUT ON SITE DO NOT MATCH WITH THE DATABASE.
 *THE INDICATED INCLINATION OF GSM IN THE TABLE WAS OBTAINED FROM THE PHOTOGRAPHIC REPORT EXCEPT THE ELECTRICAL INCLINATION OF SECTOR 1 GSM 850MHz, WHICH WAS OBTAINED FROM THE DATABASE.
 *THE WCDMA AZIMUT 850 MHz AND LTE 700 MHz OF THE DATABASE DO NOT MATCH, EVEN WHEN SHARING ANTENNA. (THE AZIMUT INDICATED IN THE TABLE CORRESPONDS TO LTE)

GSM 850 MHz/ GSM1900MHz					
SECTOR	AZIMUTH	H (Mts)	MT	ET	ANTENNA MODEL
1	12°	21.00	0°	0°/0°	DBXLH-6565A-VTM
2	135°	18.00	1°	3°/3°	DBXLH-6565A-VTM
3	225°	18.00	0°	4°/2°	DBXLH-6565A-VTM

WCDMA 850 MHz/ LTE 700 MHz					
SECTOR	AZIMUTH	H (Mts)	MT	ET	ANTENNA MODEL
1	0°	21.00	0°	6°/7°	ODV2-064R16M-G-2 R
2	105°	18.00	0°	6°/2°	ODV2-064R16M-G-2 R
3	210°	18.00	0°	1°/3°	ODV2-064R16M-G-2 R

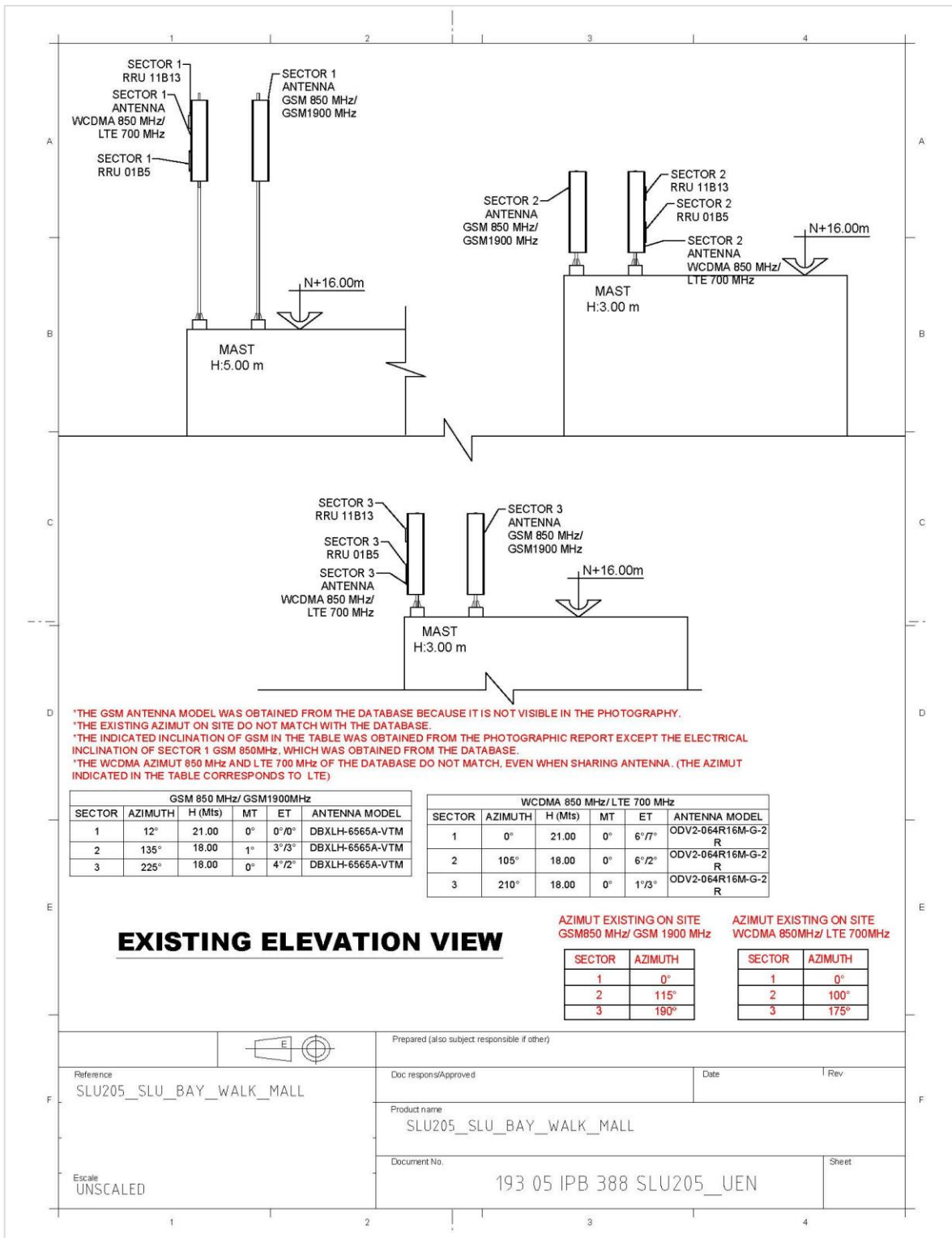
AZIMUT EXISTING ON SITE
GSM850 MHz/ GSM 1900 MHz

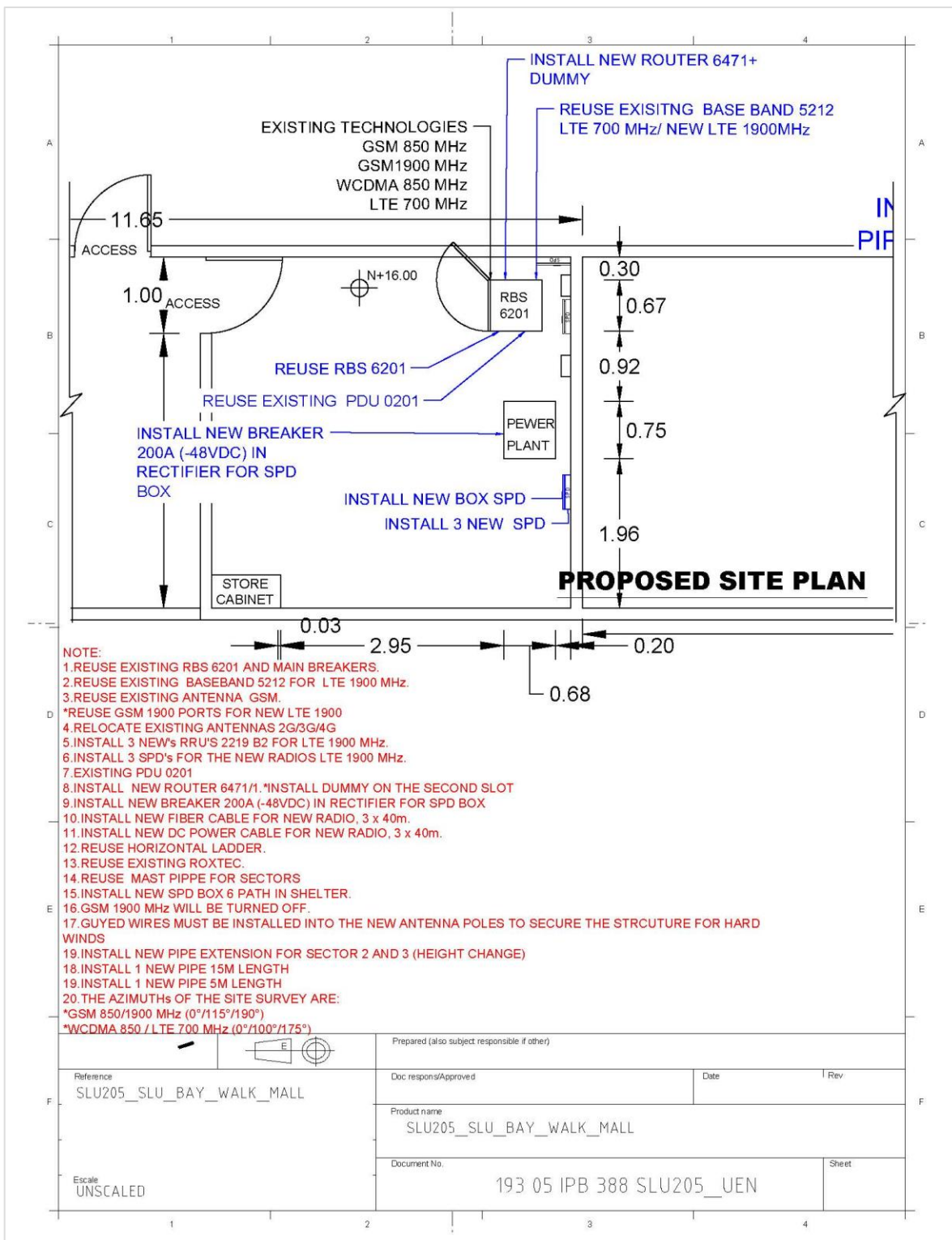
SECTOR	AZIMUTH
1	0°
2	115°
3	190°

AZIMUT EXISTING ON SITE
WCDMA 850MHz/ LTE 700MHz

SECTOR	AZIMUTH
1	0°
2	100°
3	175°

Reference SLU205_SLU_BAY_WALK_MALL	Prepared (also subject responsible if other)	
	Doc respons/Approved	Date Rev
	Product name SLU205_SLU_BAY_WALK_MALL	
Escalé UNSCALED	Document No. 193 05 IPB 388 SLU205_UEN	Sheet

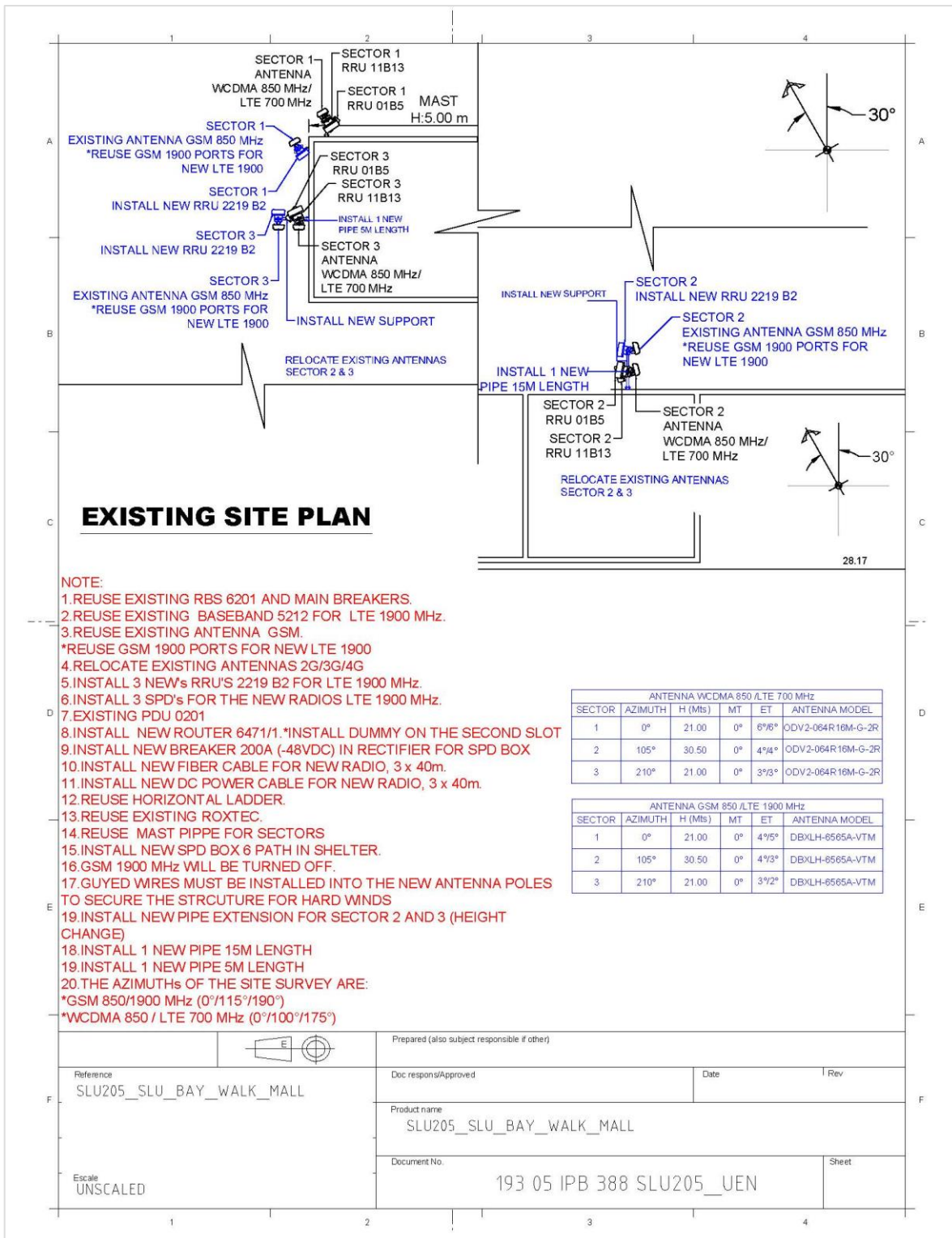




NOTE:

1. REUSE EXISTING RBS 6201 AND MAIN BREAKERS.
2. REUSE EXISTING BASEBAND 5212 FOR LTE 1900 MHz.
3. REUSE EXISTING ANTENNA GSM.
4. *REUSE GSM 1900 PORTS FOR NEW LTE 1900
5. RELOCATE EXISTING ANTENNAS 2G/3G/4G
6. INSTALL 3 NEW RRU'S 2219 B2 FOR LTE 1900 MHz.
7. INSTALL 3 SPD'S FOR THE NEW RADIOS LTE 1900 MHz.
8. EXISTING PDU 0201
9. INSTALL NEW ROUTER 6471/I. *INSTALL DUMMY ON THE SECOND SLOT
10. INSTALL NEW BREAKER 200A (-48VDC) IN RECTIFIER FOR SPD BOX
11. INSTALL NEW FIBER CABLE FOR NEW RADIO, 3 x 40m.
12. INSTALL NEW DC POWER CABLE FOR NEW RADIO, 3 x 40m.
13. REUSE HORIZONTAL LADDER.
14. REUSE EXISTING ROXTEC.
15. REUSE EXISTING ROXTEC.
16. REUSE MAST PIPE FOR SECTORS
17. INSTALL NEW SPD BOX 6 PATH IN SHELTER.
18. GSM 1900 MHz WILL BE TURNED OFF.
19. GUYED WIRES MUST BE INSTALLED INTO THE NEW ANTENNA POLES TO SECURE THE STRUCTURE FOR HARD WINDS
20. INSTALL NEW PIPE EXTENSION FOR SECTOR 2 AND 3 (HEIGHT CHANGE)
21. INSTALL 1 NEW PIPE 15M LENGTH
22. INSTALL 1 NEW PIPE 5M LENGTH
23. THE AZIMUTHS OF THE SITE SURVEY ARE:
 *GSM 850/1900 MHz (0°/115°/190°)
 *WCDMA 850 / LTE 700 MHz (0°/100°/175°)

Reference		Prepared (also subject responsible if other)	
SLU205_SLU_BAY_WALK_MALL		Doc respons/Approved	Date Rev
Product name		SLU205_SLU_BAY_WALK_MALL	
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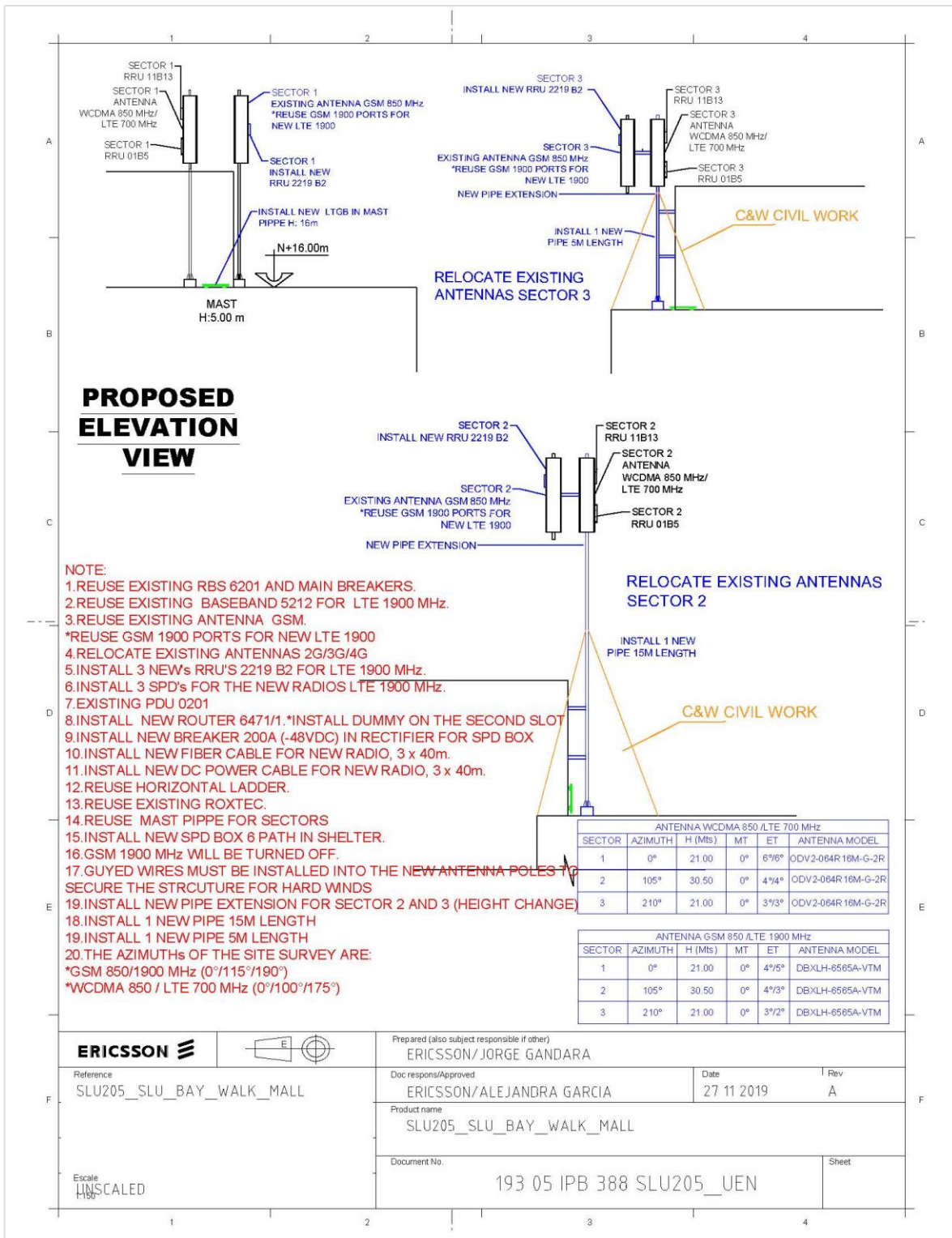


- NOTE:**
1. REUSE EXISTING RBS 6201 AND MAIN BREAKERS.
 2. REUSE EXISTING BASEBAND 5212 FOR LTE 1900 MHz.
 3. REUSE EXISTING ANTENNA GSM.
 4. *REUSE GSM 1900 PORTS FOR NEW LTE 1900
 5. RELOCATE EXISTING ANTENNAS 2G/3G/4G
 6. INSTALL 3 NEW'S RRU'S 2219 B2 FOR LTE 1900 MHz.
 7. INSTALL 3 SPD'S FOR THE NEW RADIOS LTE 1900 MHz.
 8. EXISTING PDU 0201
 9. INSTALL NEW ROUTER 6471/1. *INSTALL DUMMY ON THE SECOND SLOT
 10. INSTALL NEW BREAKER 200A (-48VDC) IN RECTIFIER FOR SPD BOX
 11. INSTALL NEW FIBER CABLE FOR NEW RADIO, 3 x 40m.
 12. INSTALL NEW DC POWER CABLE FOR NEW RADIO, 3 x 40m.
 13. REUSE EXISTING LADDER.
 14. REUSE EXISTING ROXTEC.
 15. REUSE MAST PIPE FOR SECTORS
 16. INSTALL NEW SPD BOX 6 PATH IN SHELTER.
 17. GSM 1900 MHz WILL BE TURNED OFF.
 18. GUYED WIRES MUST BE INSTALLED INTO THE NEW ANTENNA POLES TO SECURE THE STRUCTURE FOR HARD WINDS
 19. INSTALL NEW PIPE EXTENSION FOR SECTOR 2 AND 3 (HEIGHT CHANGE)
 20. INSTALL 1 NEW PIPE 15M LENGTH
 21. INSTALL 1 NEW PIPE 5M LENGTH
 22. THE AZIMUTHS OF THE SITE SURVEY ARE:
 23. *GSM 850/1900 MHz (0°/115°/190°)
 24. *WCDMA 850 / LTE 700 MHz (0°/100°/175°)

ANTENNA WCDMA 850 /LTE 700 MHz					
SECTOR	AZIMUTH	H (Mts)	MT	ET	ANTENNA MODEL
1	0°	21.00	0°	6°/6°	ODV2-064R16M-G-2R
2	105°	30.50	0°	4°/4°	ODV2-064R16M-G-2R
3	210°	21.00	0°	3°/3°	ODV2-064R16M-G-2R

ANTENNA GSM 850 /LTE 1900 MHz					
SECTOR	AZIMUTH	H (Mts)	MT	ET	ANTENNA MODEL
1	0°	21.00	0°	4°/5°	DBXLH-6565A-VTM
2	105°	30.50	0°	4°/3°	DBXLH-6565A-VTM
3	210°	21.00	0°	3°/2°	DBXLH-6565A-VTM

		Prepared (also subject responsible if other)	
Reference	Doc respons/Approved	Date	Rev
SLU205_SLU_BAY_WALK_MALL			
Product name		SLU205_SLU_BAY_WALK_MALL	
Document No.		193 05 IPB 388 SLU205_UEN	
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Appendix 5: Proofreading letter

San José, September 05, 2020

Universidad para la Cooperación Internacional

To Whom It May Concern:

Natalia Alvarado Mata, identification number 305030705, Bachelor in English with a focus on translation, hereby states that the project titled: **Project Management Plan for the Updating of the FLOW Saint Lucia Radio Access/Mobile Network to the Long Term Evolution (4G) Technology**, carried out by Horace Popo, has been revised.

The project was carried out to obtain the **Master in Project Management (MPM)** Degree. Aspects such as paragraph form, language quirks in written language, orthography, punctuation, and other aspects related to syntax and grammar were inspected and proofread. Therefore, taking into account the changes that were made, the project is ready to be presented.

Sincerely,

Natalia Alvarado



Natalia Alvarado Mata

English Translator and Proofreader

natalia.alvarado@filologos.cr

**NATALIA
ALVARADO
MATA (FIRMA)**

Digitally signed by NATALIA ALVARADO MATA (FIRMA)
DN: SERIALNUMBER=CPF-03-0503-0705,
SN=ALVARADO MATA, G=NATALIA, C=CR,
O=PERSONA FISICA, OU=CIUDADANO,
CN=NATALIA ALVARADO MATA (FIRMA)
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