UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

PROJECT MANAGEMENT PLAN FOR THE REHABILITATION OF FEEDER AND AGRICULTURAL ROADS PROJECT-PHASE II, SAINT LUCIA

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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

November 2019

UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

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

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DEDICATION

This research is dedicated to my wife Christine and my children Leslie and Khristal for selflessly standing with me in my pursuit of better educating myself in the area of Project Management.

ACKNOWLEDGMENTS

Thanks to Miss Stacey Frederick and Miss Marthaline Angelo for their invaluable assistance in helping me with the editing of the FGP document.

I am very grateful to all those individuals who helped me in any way with this project, including my tutor Mr Carlos Brenes and all the course facilitators that influenced my professional development during my studies at UCI.

I am indeed indebted to the Organization of American States (OAS) for providing me with a scholarship to pursue the Masters in project Management Course.

Finally, my thanks go to God, the one who has been my guide, strength and success throughout this course and provided me with this opportunity to further my studies.

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ABBREVIATIONS AND ACRONYMS

- Actual Cost of Work Performed (ACWP)
- American Association of State, Highway and Transport Officials (AASHTO)
- American Standards for Testing of Materials (ASTM)
- British Standards (BS)
- Budget at Completion (BAC)
- Budgeted Cost for Work Performed (BCWP)
- Budgeted Cost of Work Scheduled (BCWS)
- Central Tenders Board (CTB)
- Configuration Control Board (CCB)
- Configuration Management Database (CMDB)
- Construction Manager (CM)
- Construction Quality Assurance Manager (CQAM)
- Cost Performance Index (CPI)
- Cost Variance (CV)
- Critical Path Method (CPM)
- Department of Infrastructure, Ports, Energy and Labour (DIPE)
- Departmental Tenders Board (DTB)
- Design Manager (DM)
- Design Quality Assurance Manager (DQAM)
- Development Control Authority (DCA)
- Earned Value (EV)
- Earned Value Management (EVM)
- Environmental Impact Statement (EIS)
- Environmental Management Plan (EMP)
- Estimate at Completion (EAC)
- Estimate to Complete (ETC)
- Feeder and Agricultural Roads Project Phase II (FAARPII)

- Finish to Finish (FF)
- Finish to Start (FS)
- Geographic Information System (GIS)
- Gross Domestic Product (GDP)
- International labor Organization (ILO)
- Internal Rate of Return (IRR)
- Inspection Test Plan (ITP)
- Job Procedures (JP)
- Kuwait Fund for Arab Economic Development (KFAED)
- Location/Design Concept Report (L/DCR)
- Materials Approval Engineer (MAE)
- Microsoft (MS)
- Ministry of Infrastructure, Ports, Energy and Labour (MIPEL)
- NCR Non-Conformance Report (NCR)
- Net Present Value (NPV)
- Non-Governmental Organization (NGO)
- Notice to Proceed (NTP)
- Plan Do Check Act (PDCA)
- Planned Value (PV)
- Precedence Diagramming Method (PDM)
- Project Management Book of Knowledge (PMBOK ® Guide)
- Project Management Institute (PMI)
- Project Management Unit (PMU)
- Project Quality Plan (PQP)
- Quality Assurance (QA)
- Quality Assurance Plan (QAP)
- Quality Control (QC
- Quality Testing Supervisor(QTS)
- Responsible, Accountable, Consulted and Informed (RACI)

- Review of Environmental Factors (REF)
- Right of Way (ROW)
- Risk Breakdown Structure (RBS)
- Road Asset Management System (RAMS)
- Saint Lucia Air and Seaports Authority (SLASPA)
- Schedule Performance Index (SPI)
- Stakeholder management Plan (SMP)
- Statement of Work (SOW)
- Special Projects Unit (SPU)
- Start to Finish (SF)
- Start to Start (SS)
- Technical Services Department (TSD)
- To Complete Performance Index (TCPI)
- United Kingdom Development Fund for International Development (UK-DFID)
- Work Health and Safety (WHS)

EXECUTIVE SUMMARY (ABSTRACT)

The project to develop the Project Management Plan for the Government of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project-Phase II (FAARP II) was required to effectively create the documents and identify the tools to be used by the Project Management Team during the Executing, Monitoring, Controlling, and Closing processes.The GOSL endeavors to undertake the rehabilitation of 37.50 km of Feeder and Agricultural roads in various parts of the island with a view to significantly improve the quality of those roads.

The MIPEL recognized that without a proper plan for project implementation it would be severely challenged to deliver a successful project to the stakeholders. Hence, in order to deliver effectively, the MIPEL charged the Project Manager with the responsibility to create a Project Management Plan (PMP). This was achieved through the detailing the management of all critical aspects of the project. The purpose of such a document was to provide a comprehensive baseline of the project goals, how it is to be achieved, who will be involved, how it will be reported and measured and how information will be communicated. It will be a reference for any decision made on the project and for clarification of unclear areas.

The General objective was: To create a Project management Plan in conformity with the standards of the Project Management Institute to effectively manage phase II of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project.

The Specific objectives were: to develop the Integration Management Plan in order to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan; to create a Scope Management Plan to ensure that the boundaries of the project are well defined from the outset and monitored rigorously; to create a Schedule Management Plan to divide the project into tasks and create both a schedule so as to ensure that the project is completed within the time constraints; to create a Cost management Plan to define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure the project is completed within budget;to create a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its performance within the triple constraints of Time, Cost, and Quality;to create a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope; to create a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information; to create a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from

occurring and reduce their impact should they eventuate;to create a Procurement Management Plan to describe how items will be procured during the project, and the approach that will be used to manage vendors on the project to deliver results; to create a Stakeholder Management Plan to systematically identify, analyze, plan and implement actions designed to address, support, engage and manage all project stakeholders.

The methodology used for the research was analytical.The main sources used to obtain information included the PMBOK® Guide Sixth Edition (2017), Construction Extension to the PMBOK® Guide (2016) and MIPEL standards, policies and procedures. The information was analysed to create each subcomponent of the subsidiary plans used to develop the Project Management Plan providing justification for the decisions made while developing the project's integration, scope, time, cost, quality, resources, communication, risk, procurement, and stakeholder management plans.

It is concluded that in order to ensure the success of FAARP II, the development team should carefully analyse the project to determine the complexities of stakeholder impact and potential project ambiguity (e.g., the possibility of emergent issues or situations due to feedback and characteristics of stakeholder interrelationships) before confirming commitments for scope, time, quality, safety, and cost.

The results of the Project Management Plan, developed using the PMBOK® Guide 6th Edition provided a methodology to ensure that the FAARPII project is executed fully to the requirements of the Government of Saint Lucia and the Funding Agency, the Caribbean Development Bank. Implementation within the triple constraints of scope, budget and schedule is a guarantee for future funding for the GOSL and also a success factor for the government from an economic and political standpoint.

In respect of the key recommendations, the DIPE should (1) employ formal PMBOK® based Project Management strategies to increase the likelihood of project success in the completion of civil engineering projects;(2) develop standard project management initiation and planning documents prior to the execution of civil engineering projects ;and (3) standardize the use of the planning process and templates created during the development of the Project Management Plan for FAARPII-Package 1 for all future civil engineering projects valued in excess of $1,000,000.00.

It is expected that the template provided by this plan along with the recommendations given at the end of this study will serve as a road map for the development of Project Management Plans for future major road projects to be undertaken by the Department of Infrastructure, Ports energy and Labour (DIPE).

1.0 INTRODUCTION

1.1 Background

St. Lucia's agricultural sector, though no longer the driving force of the island's economy, is still an important contributor to the livelihoods of small farmers. However, their earning potential has been adversely affected by the poor riding condition of many of the roads servicing local farms. Reduced quality of export produce such as bananas and locally distributed root crops resulting from bruising, coupled with the higher vehicle operating costs have rendered farming to be an expensive venture, with diminished profitability.

In an effort to reduce hardship on farmers, while also affording the general motoring public greater vehicular comfort and safety when traversing agricultural access roads, the Government of Saint Lucia (GOSL) (the Client) has earmarked 15 (No) feeder and agricultural roads, 37.5km in total length, for rehabilitation under the captioned project. This improvement in quality is meant to be undertaken against the backdrop of sustainability, as the incorporation of timely maintenance strategies into the implementation framework is expected to guarantee the roads' design lives.

In undertaking the Feeder and Agricultural Roads Rehabilitation Project – Phase II, the GOSL seeks to fulfil its mandate in improving the strength and general road riding condition on the targeted roads. The Government of Saint Lucia (GOSL) endeavours to undertake the rehabilitation of 37.50 km of Feeder and Agricultural roads in various parts of the island with a view to significantly improve the quality of those roads. Indicative location of the targeted roads is given below. The major goal is to maintain the safety and ride quality of these roads to keep user costs down.

1.2 Statement of the Problem

GOSL is ready to implement the project and urgently requires a Project Management Plan for the successful implementation of the project to the satisfaction of all stakeholders.

GOSL through the Ministry of Infrastructure, Ports Services, Energy and Labour (MIPEL), the implementing agency seeks to implement the FAARP-II, which is a **$44,984,223** road repair project. This is a very large project and it is imperative that the necessary measures are in place to ensure the project's successful completion within the constraints of time, cost, scope and quality. Standard operating procedures for project management at the MIPEL are not in conformity with the Project Management Institute's (PMI) guidelines for project management, which provide best practices for successful project implementation and hence cannot guarantee successful project delivery to stakeholders for a project of this magnitude. In light of this shortcoming, it is necessary to develop an extensive and robust project management plan, which will support and successfully guide the project team in all aspect of project deliberations thus significantly increasing chances of project success. Each element of the plan is to be developed, replete with all the inputs, tools, techniques, concepts and outputs necessary to justify each management decision.

1.3 Purpose

On a yearly basis, the Government of Saint Lucia invests millions of dollars in its Public Sector Investment Program (PSIP). This PSIP includes among other developmental projects, infrastructural projects such as FAARP II. More often than not, the implementing agencies are challenged to implement those projects successfully. One of the reasons for this is the lack of adequate knowhow or the lack of commitment to implement in respect of project management planning. Additionally, it is quite challenging to achieve PSIP goals accomplishing all the requirements and deliver results in time and within the forecasted costs. For these reasons the chance of project failure can be quite high.

The Ministry of Infrastructure, Ports Services, Energy and Labour (MIPEL) which is the implementing agency for FAARP II recognizes that without a proper plan for project implementation it will be severely challenged to deliver a successful project to the stakeholders. According to Truman, one of the main reasons “cited during disputes [as a source of project failure] is the failure of the Project Management Team to adequately plan the work…” (King,2016, p.5). Hence, in order to deliver effectively to stakeholders, the MIPEL has charged the Project Manager with the responsibility to develop a Project Management Plan (PMP) by detailing the management of all critical aspects of the project.

The purpose of such a document is to provide a comprehensive baseline of the project goals, how it is to be achieved, who will be involved, how it will be reported and measured and how information will be communicated. It will be a reference for any decision made on the project and for clarification of unclear areas. Such a document will be used as a reference throughout the project to ensure that the management of the project is carried out consistently and in line with policy and procedures. Although the PMP develops as part of the project initiation and definition, it is expected to be a living document that evolves as the project progresses and is updated with the latest relevant information as required.

The PMP shall be available to all project members as it provides essential project information and can introduce project members to the project. The project management plan shall be the main communication document for the project.

The research proposal will use the Project Management Institute’s (PMI) guide to develop and detail a Project Management Plan, providing justification for the decisions made while developing the project’s integration, scope, time, cost, quality, resources, communication, risk, procurement, and stakeholder management plans.

A lack of planning will always contribute towards an unsuccessful project whereas good planning leads to successful projects.

Project Benefits

a) Economic benefits
   i. Increase in the value of land where service routes have been rehabilitated
   ii. Increase in the Gross Domestic Product (GDP)
   iii. Increase in the value of Government's assets

b) Social Benefits
   i. Decrease in poverty
   ii. Creation of employment
   iii. Improved service routes to minibus drivers
   iv. Reduction in passenger traveling time
   v. Environmental Benefits
   vi. Less land slippages due to retained/stabilized slopes

1.4 General Objective

To create a Project management Plan in conformity with the standards of the Project Management Institute to effectively manage phase II of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project.

1.5 Specific Objectives

1. To develop the Integration Management Plan in order to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.

2. To create a Scope Management Plan to ensure that the boundaries of the project are well defined from the outset and monitored rigorously.

3. To create a Schedule Management Plan to divide the project into tasks and create both a schedule so as to ensure that the project is completed within the time constraints.

4. To create a Cost management Plan to define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure the project is completed within budget.

5. To create a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its performance within the triple constraints of Time, Cost, and Quality.

6. To create a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.

7. To create a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.

8. To create a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.

9. To create a Procurement Management Plan to describe how items will be procured during the project and the approach that will be used to manage vendors on the project to deliver results.

10. To create a Stakeholder Management Plan to systematically identify, analyze, plan and implement actions designed to address, support, engage and manage all project stakeholders.

2 THEORETICAL FRAMEWORK

2.1 Company/Enterprise Framework

2.1.1 Company/Enterprise Background

The project in question forms part of the Government Public Sector Investment Program for the Medium term. It will be implemented through the Technical Services Department (TSD) of the Ministry of Infrastructure, Ports, Energy and Labour (MIPEL). In respect of accountability to the Minister of Finance, the implementing agency shall be the Ministry of Infrastructure, Ports, Energy and Labour.

The office of the Governor General, acting on the advice of the Prime Minister, through the constitution of St. Lucia has the authority to assign or change Ministerial portfolios. A Minister as determined by the Constitution heads the MIPEL. A Chief Engineer, whose authority is enshrined in the Works and Road Act (2001), heads the Technical Services Department of the MIPEL. The 2019 Estimates of Revenue and Expenditure Volume I, approved by the Parliament of Saint Lucia, defines the broader functions of this Ministry.

The objective of this Ministry is to develop and maintain modern, affordable, adequate and resilient infrastructure that will support social and economic development. MIPEL and specifically the Department of Infrastructure, Ports and Energy (DIPE) is in charge of the entire public road network including bridges. In addition, DIPE is in charge of rivers and riverbanks, jetties, flood and erosion protection as well as for issuing licenses for dredging of sand for industrial use in the mouth of rivers. Some infrastructure, such as schools, hospitals, ports and airports, are managed and operated by other Ministerial agencies and the statutory body (Saint Lucia Air and Seaports Authority (SLASPA), and not DIPE. Traffic Safety and use of roads is not solely under the administration of the Ministry, however it is a shared responsibility with the Department of Economic Development, Transport and Civil

Aviation. Private Roads are considered only after the adoption by the DIPE. New constructions and major up-grading including extension work is a policy decision. The task of the Technical Services Department (TSD) of DIPE in this respect is to estimate the expected costs for these measures. Consultancy services are sought where feasibility studies and major designs are required. The Ministry of Finance approves the budget for all measures. TSD takes care of planning of infrastructure and construction measures, especially regarding compliance with technical standards. Regarding the compliance with environmental standards as well as in cases of compulsory land acquisition close cooperation with the Development Control Authority (DCA) takes place. The Chief Engineer is a member of the DCA.

Road maintenance is partly being executed with DIPE staff, partly by contractors. DIPE staff takes care of all potholing measures. The budget for maintenance measures is allocated to the TSD on a quarterly basis.

In the case of FAARP-II, it is expected that the Department of Planning and National Development of the Ministry of Finance (St. Lucia) will provide project oversight for compliance with Finance Agreements, which will also be the liaison between the sponsors and the implementation agency.

MIPEL, with the help of a proficient engineering consultant is capable of effectively undertaking the technical supervision of the project. It is assumed that the selection and evaluation criteria in respect of procurement will be subjected to the approval of the sponsors. Further, the MIPEL and the local engineering sector have extensive experience in implementing major capital projects with greater scope and complexity than this project. More significantly the Feeder and Agricultural Roads Rehabilitation Project Phase I was successfully executed in its entirety by local contractors and supervised primarily by local consultants. FAARP Phase I was co-funded by the Government of Saint Lucia and Kuwait Fund for Arab Economic Development (KFAED).

A process is already entrained to establish a dedicated Project Management Unit (PMU) to manage the project. This is consistent with the Ministry's approach to managing capital funds from multilateral lending sources. Notwithstanding the above, the GOSL has experienced a mixed bag of success and failure in implementing very large externally funded projects. The MIPEL has recognized that one of the main reasons for this is the lack of a Project Management Plan for each project grounded in tried and tested standards and principles as detailed for example in the Project Management Institute's (PMI) PMBOK guide. Hence moving forward, the intention is to embrace those standards and principles and formulate a comprehensive strategy for project execution in the instance of the FAARP-II.

The MIPEL also has the institutional capacity to maintain the project roads through its existing structure. Presently, most maintenance activities are done through private contractors with some routine maintenance done by an in-house MIPEL Road Maintenance Unit or Potholing Unit. There is also excess capacity in the private sector to maintain the project.

Like most governmental institutions, the MIPEL considers continual professional development key to adapting to new methods, practices and technologies with the aim of continually reducing cost. It is necessary that staff engage in both in-house and external training in all areas associated with designs, management and maintenance of all civil infrastructure managed by the Ministry.

2.1.2 Mission and Vision Statements

2.1.2.1 Mission

To develop and maintain modern and resilient infrastructure that can support Saint Lucia's social and economic development through:

- Road Safety

- Qualitative Meteorological data and information
- High levels of safety of electrical installations
- Construction and maintenance of civil infrastructure
- Enhancing port facilities
- Affordable and Reliable Energy Services
- Provision of Quality Water Services

Accomplished through professionalism and teamwork in accordance with international standards.

2.1.2.2 Vision

To be a flagship Ministry, critical to achieving infrastructural and national development.

2.1.3 Organizational Structure

The MIPEL operates through two main offices: the head office in the north (Castries), and the other in the south of the island (Vieux Fort) which offers technical, electrical and transport related services. In addition, two branch offices of the Technical Department are located in the south-western districts of Choiseul and Soufriere, and a sub office in the east at Dennery. Additionally, there are offices of the meteorological services department housed at the island's two airports in Vieux Fort and Castries.

These functions of the MIPEL are executed though five departments:
(I) Policy, Planning and Administrative Services
(ii) Meteorological Services
(iii) Energy
(iv) Technical Services
(v) Electrical
Each department comprises multiple functional units.

While the MIPEL is the agency charged with the implementation of the project, the TSD specifically handles project management. A detailed breakdown and functions of the Units that comprise the TSD follows overleaf.

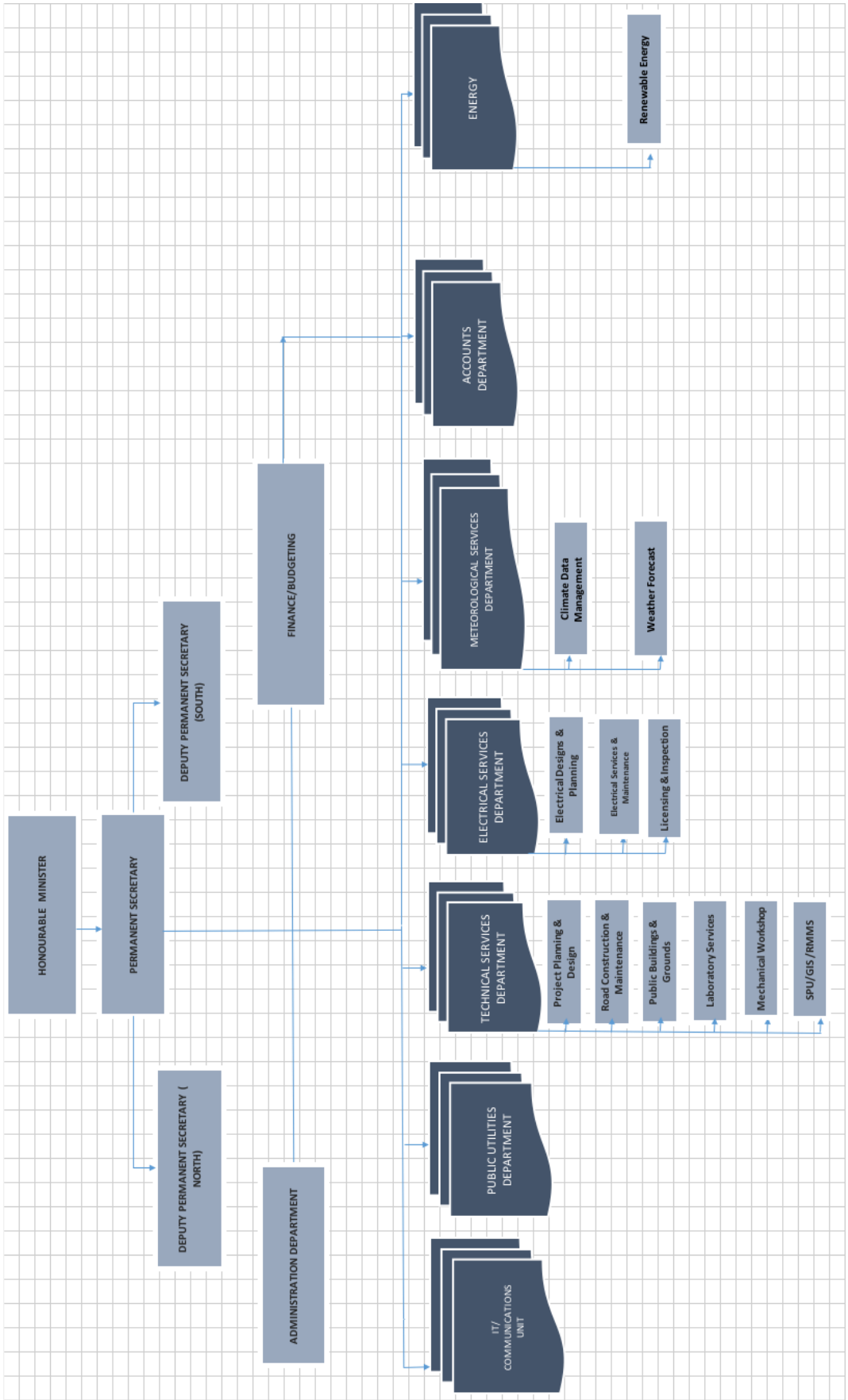


Figure 1 Organizational Structure. (Source MIPEL)

2.1.3.1 Project Planning and Design Unit

The Project Planning and Design Unit is not yet existing but planned. The Unit will take care of all planning of work and make use of all available data sources of DIPE, for instance the Road Asset Management System (RAMS), Material Testing Laboratory, and any other necessary work. For major construction and rehabilitation projects, the Unit will be in charge of quality control and quality assurance and the monitoring of contracts and construction management. Tasks of the unit will include:

- Designs
- Development of Estimates
- Elaboration of work schedules
- Planning of necessary work

2.1.3.2 Construction and Maintenance

2.1.3.2.1 Traffic Signs Unit

The unit takes care of maintenance, installation and improvement of traffic signs as well as of road markings. The Traffic Sign Unit procures, installs and repairs traffic signs. It also installs traffic mirrors on the entire island. The Unit coordinates with the transport department and the traffic department of the Royal St. Lucia Police Force.

The location of traffic signs on the roads is legislated by and to be decided by the Road Transport Board. If any new traffic signs or other road installations, for instance new speed humps, are to be installed the Transport Department decides where they are to be installed. Traffic Signs Unit executes the actual installation and/or painting.

The Traffic Signs Unit also takes care of the traffic management, e.g. during the construction phase of a new hotel in liaison with the Transport Department. The traffic light department within the electrical department is in charge of all matters pertaining to Traffic Lights.

2.1.3.2.2 Potholing Unit

TSD's own staff of the Potholing Unit carries out a major part of the repair work of roads, that is, the repair of cracks and potholes. There are 3 gangs in the North and 2 gangs in the South to take care of necessary minor repairs. These tasks are taken care of in-house in order to ensure good quality and fast response.

Main tasks of the Potholing Unit

- Periodic maintenance of roads
- Daily inspection of main roads by driving and recording them in daily inspection reports. The zonal staff also pays attention by daily inspection and directly informs the Potholing Unit. Sub-offices are controlling the secondary and third roads and report to the Potholing Unit.
- Periodic inspection, focused on cracks before becoming potholes
- Cleaning cracks by using methods according to technical standards
- Repairing potholes according to technical standards
- Cleaning all island roads to prevent hazards
- Cleaning of gutters and of the drainage channels at the roadside

The Road Maintenance Management System (RMMS) set up a database giving information on the condition of all primary, secondary and tertiary roads in St. Lucia as well as on all bridges. The web-based database will be a tool for planning and scheduling maintenance and rehabilitation. In view of the tasks of the potholing unit, it is obvious that the RAMS with its RMMS has to be linked to the unit and regular information exchange has to be ensured. The information contained in the RMMS has to be made available to the potholing unit to help prioritising work and to establish and reason the planned budget for maintenance and repair work of roads.

2.1.3.3 Public Buildings and Grounds

The unit is responsible for maintenance and repair of all public buildings in St. Lucia except of schools and hospitals. Regular inspections and maintenance work are carried out as well as supervision of contractors in case of new buildings or major

rehabilitation work. Schools are now under the responsibility of the Ministry of Education. However, currently the unit still assists with the electrical maintenance planning and ensures that electrical standards in case of new installations and repair work is being adhered too.

Presently, although construction companies are still maintaining many of the police stations, the unit is still assisting with most of the works. However, in future the full responsibility will be that of the building unit.
Main tasks of that Unit are as follows:

- Maintenance and inspection of all government and public buildings, such as post offices, public services, police and fire stations.
- Assisting with the construction/management of government and public building projects.

In total about 200 public buildings have to be regularly inspected and maintained.
The unit regularly/annually assesses the condition of all buildings, prioritizes the work and compiles a budget for Maintenance and Capital works based on these assessments. Currently, all annual inspections are carried out with manual paper-based templates; an electronic database is not available.

Further to the work under the responsibility of TSD the unit also gives assistance to other ministries in project management and prepares contract documents. The unit monitors the work of external consultants.

Another task of the unit is to ensure the availability and proper condition of shelters for emergency / disasters. Each year, the unit compiles a list of suitable public buildings for NEMO. This list comprises buildings per community or village. Many of the buildings suitable to serve as shelter are schools.

2.1.3.4 Laboratory Services

The Material Testing Laboratory is located at Union near DIPE's compound in Castries. It takes care of quality control. Testing of soil, concrete and asphalt are carried out. A large part of the equipment is of considerable age and are not maintained and calibrated on a regular basis. The staff knows the testing work from practical work experience but have mostly no formal training. On average the staff has a long work experience and is of higher age, partly close to retirement. Generally, the testing equipment is in working condition, however needs some calibration. The apparatus for asphalt testing and those for Direct Shear test and the centrifuge extractor is very old. These apparatuses have to be upgraded or replaced and calibrated.

2.1.3.5 Mechanical Workshop

The Mechanical Workshop is located in Dennery and takes care of maintenance and repair of the Ministry's fleet of vehicles and heavy equipment. Further, it produces concrete pipe culverts for use by the public and the private sector. The workshop also provides a fleet of road construction and maintenance equipment to the Potholing Unit of TSD. Twenty-nine (29) persons are employed at the workshops. The workshop comprises a vehicle workshop, a store, a welding station, a tyre repair shop, a culvert casting facility as well as a filling station for diesel and petrol.

2.1.3.6 Special Projects Unit (SPU)

This unit also comprises a Geographic Information System (GIS) and RAMS

2.1.3.6.1 Special Project Unit

SPU takes care of project coordination and monitoring of major capital projects implemented by DIPE / TSD, especially externally funded projects e.g. by the Caribbean Development Bank (CDB), Kuwait Fund for Arab Economic Development (KFAED), United Kingdom Development Fund for International

Development (UK DFID). For World Bank funded projects, a separate Project Coordination Unit is set up in the Department of Economic Development, Transport and Civil Aviation. The SPU provides project management services for the entire project life cycle from feasibility studies, designs, development of tender documents, tendering, evaluation and award to implementation and contract monitoring in accordance with the stipulations of the respective funding agency and the Finance Act of St. Lucia. The unit monitors the quality of project execution and compliance with the contract and all relevant technical standards and laws and regulations of St. Lucia. The SPU has to confirm successful project completion and to report to the funding agency.

The Unit was established by the Ministry to monitor the implementation of projects and to head project coordination. The Unit is not permanently manned with the same staff but established for projects; the curriculum vitae (CV) of the project coordinator has to be approved by the Funding Agency.

In case a consultant is engaged for supervision of construction projects he reports to SPU. The Unit then monitors that the contract is fulfilled according to the contract obligations. SPU is subordinated to the Chief Engineer and organised as illustrated as in the figure 2 below.

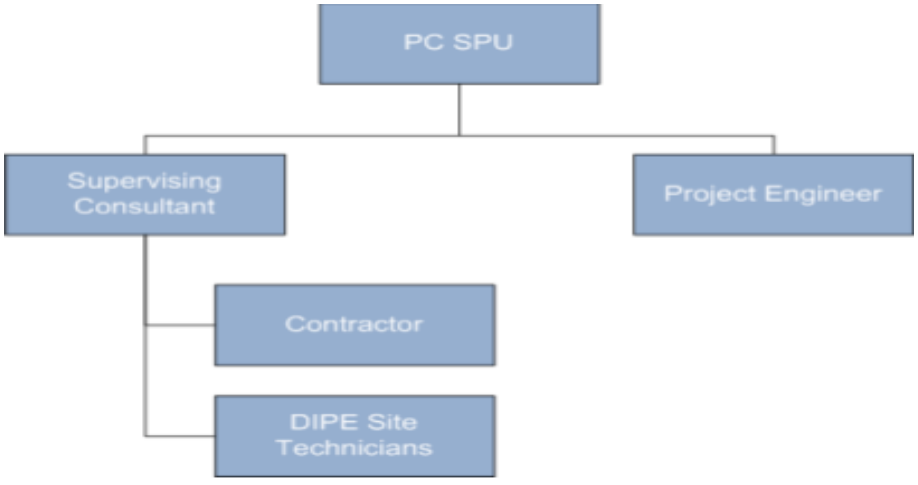


Figure 2: Project Management Structure of SPU (Source: DIPE Presentation of SPU 2015)

2.1.3.6.2 Road Asset Management System (RAMS)

The Road Asset Management Unit is still to be established. Its projected roles and functions are described below.

The unit takes care of road asset data collection and management. Data collection, validation, storage and analyses serve the whole management of the road organization of MIPEL in creating road policies, plans, reports, budget requirements and other analyses needed for effective and sustainable road network management.

The work of the unit is based on the IT-supported RMMS, which is supported and maintained by the unit. The unit manager reports to the Chief Engineer and the unit is suggested to be staffed with 6 permanent staff as illustrated below.

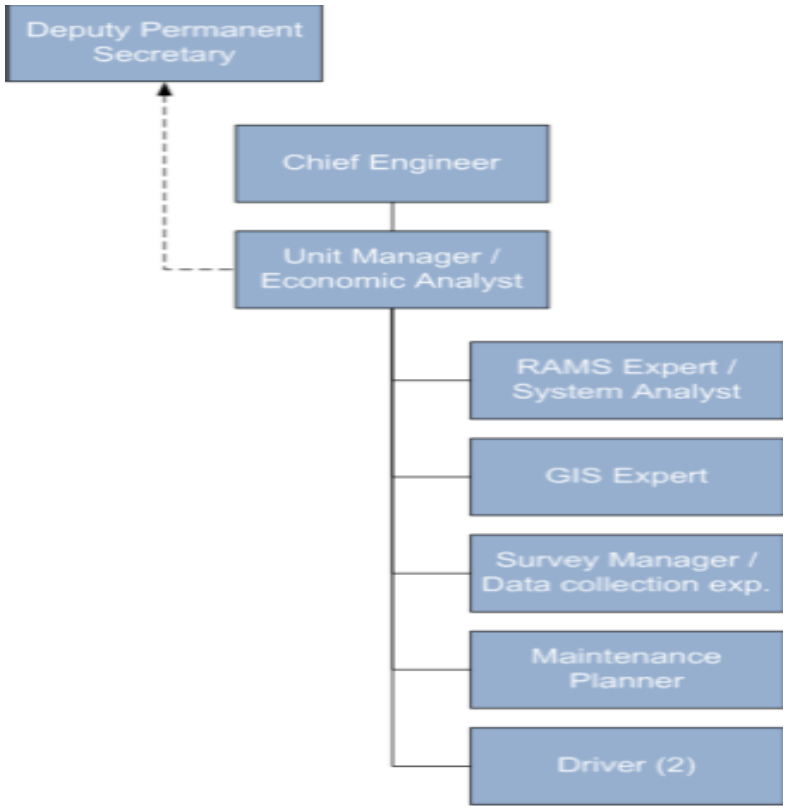


Figure 3 Structure of proposed RAMS (Source: Sirway 2018, illustration HPC/Sellhorn)

In case of need, the staff will be supplemented with additional experts collecting data and additional drivers. These additional staff will only be employed in case of need for high volumes of data capturing, in other times they work in other TSD units.

2.1.3.7 Survey Unit

The Survey Unit carries out surveys for any construction or rehabilitation measure, which is not contracted out – this concerns maintenance work and smaller projects.

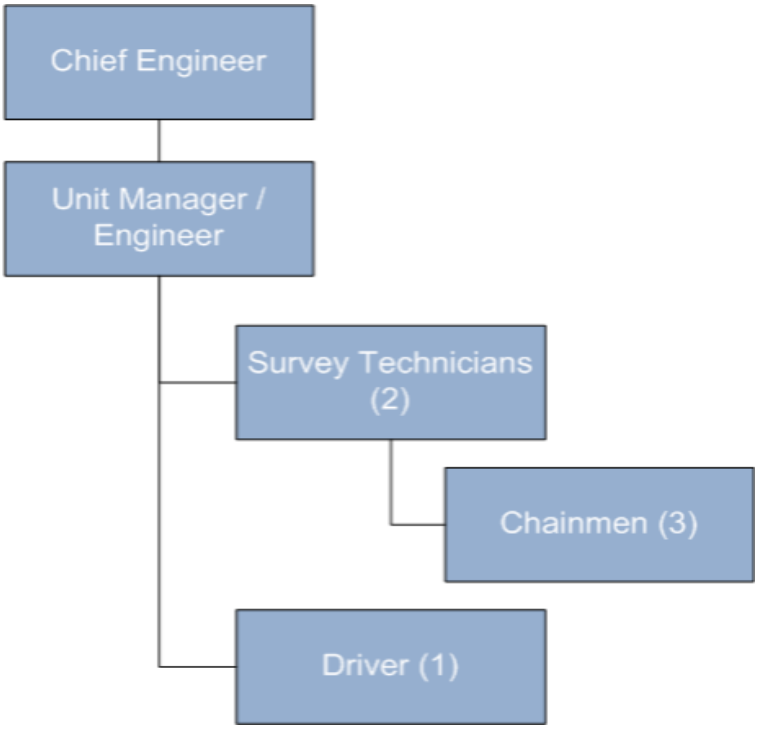


Figure 4: Survey Unit (Source: HPC/Sellhorn)

Main tasks of the Survey Unit are:

- Survey of new bridges and roads
- Survey of small reconstructions of roads and bridges
- Survey of roads as part of road maintenance and infrastructure.

2.1.3.8 Quantity Surveying Unit

The Quantity Surveying Unit is located in the Union Office and provides support to all units of the TSD. The team consists of two Quantity Surveyors and two Technicians.

Functions of the Quantity Surveying Department

- Assisting the Contracts Department in respect of all matters pertaining to contract Document compilation.
- Preparation and review of Bills of Quantities
- Preparation of the Payment Certificates
- Evaluation of tenders in consultation with Departmental and Central Tenders board (DTB) & CTB)
- Determination of interim progress payments in consultation with the Supervising Engineer.
- Re measurement of Civil Works
- Monitoring and Evaluation of projects
- Contact price adjustment
- Verification and Certification of Contracts
- Maintenance of a Rate Database
- Project Auditing

2.1.3.9 Procurement and Contract Management Unit

Procurement and contract management are handled by the Contract Department of the MIPEL. All procurement is required to be in compliance with the Finance Act of Saint Lucia. There are three levels of procurement:

- Works and services up to EC$50,000 can be directly contracted by TSD without a formal bidding process
- EC$50,000 to EC$100,000 is decided upon by the DTB and partly through direct award.
- Over EC$100,000: a formal competitive bidding process has to take place, administered by the Central Tender Board. However, the Minister of Finance can also decide to make a direct award Bidding. This is done frequently by compiling short lists without a pre-qualification process. Open, competitive bidding is seldom.

External funding, for example through the Caribbean Development Bank (CDB) is being handled by the Special Projects Unit (SPU). Generally, tendering and contracting are regulated by the Finance Act as well as the funding agency's Procurement guidelines.

Work Orders for road maintenance measures usually have a budget below EC$50,000 and are thus under the responsibility of TSD.

Generally, the procurement regulations are meeting the requirements of TSD however, it was stated that it would be appreciated if the threshold value was increased from EC$50,000 to EC$75,000 in order to facilitate contracting and to increase the efficiency in contracting for smaller maintenance measures.

2.1.4 Products Offered

The MIPEL is a government institution charged by the Constitution to provide a high quality of service to the people of Saint Lucia. It is charged with:

(i) Planning, design, construction and maintenance of road Infrastructure;
(ii) The operations of the air and sea ports which are managed by a statutory authority (St. Lucia Air and Sea Ports Authority - SLASPA);
(iii) Traffic Safety;
(iv) Meteorological services including climate data management and weather forecasting;
(v) Planning, design, construction and maintenance of public buildings and grounds;
(vi) Electrical licensing and inspection;
(vii) Energy Planning and Management

These products or services are executed though five departments:

(i) Policy, Planning and Administrative Services
(ii) Meteorological Services

(iii) Energy
(iv) Technical Services
(v) Electrical

As indicated prior, each department comprises multiple functional units. The services required under the FAARP-II fall under (i) Planning, design, construction and maintenance of road infrastructure.

2.2 Project Management Concepts

The development of the Project Management Plan for FAARP-II will be based on a project management methodology, which is based primarily of the Project Management Body of Knowledge –Sixth Edition (PMBOK®) as published by the Project Management Institute (PMI). The writing in this section seeks to detail in summary the fundamental principles which undergirds the basic tenets of sound project management planning as detailed by the PMI which is so essential for project success. In this section, we will detail in summary form the various project management concepts related to the development of a Project Management plan.

2.2.1 Project

The project to be implemented is the Government of Saint Lucia's Feeder and Agricultural Road Rehabilitation -Phase II (FAARP II). This involves the rehabilitation of 37.5 km of selected Feeder and Agricultural roads. The development objectives to be achieved through the implementation of the project are:

- Promote and enhance social and economic development throughout the country.
- Improve significantly the general condition of St. Lucia's road network.
- Afford greater comfort to motorists
- Guarantee through timely intervention the design life of roads
- Improve control and disposal of storm water
- Increase the longevity of existing roads

- Safeguard the investment made in road improvement

The above is expected to be achieved through:

- Protection of the structural integrity of the existing roads
- A reduction in the incidence of local base failures by taking both curative and preventative measures to improve drainage and verges to combat the destructive effect of water on the infrastructure.
- Prevention of the gradual expansion of deteriorated parts of the road by efficient potholing measures.

Benefits from project implementation are expected to be in the nature of:

- Improved accessibility
- Employment generated during construction
- Improvement in the quality of life of the residents
- Improvement in the ride quality of the roads

FAARP Phase I has been implemented and it is envisioned that FAARP Phases II will be implemented over a 3-year period, during the fiscal years 2020 to 2023.

But what is a project?

“A project is a limited duration unique endeavour that produces a one-off set of deliverables that are not brought about by continually ongoing repetitive operations; i.e. not “Business As Usual” (BAU). For example; developing a new software application is a project, but the daily customer support of this software product once it has been publically released is not a project but rather an ongoing operation;

A project has either a definitive beginning and/ or a definitive end by when a specific collection of objectives will have been achieved to the satisfaction of the project’s stakeholders, or it is decided that these objectives cannot be effectively

achieved, or these objectives are no longer applicable and thus the project is not required anymore.“ (Boyde, Joshua, p.20, 2014).

There are many kinds of projects. FAARP-II can be defined as an engineering construction or civil works project. Civil works projects are about creating things like bridges, buildings, roads, and railways. The purpose of an engineering construction project is to build these structures in the most efficient, safe, sustainable, and environmentally friendly way possible. Following the construction phase is an asset management phase. In this phase, you outline the maintenance, operation, and refurbishment over the lifespan of the project. These things need to be managed so that the owner of the project can make sure that there is value in return for money spent on the project.

A project is usually deemed to be a success if it achieves the objectives according to their acceptance criteria, within an agreed timescale and budget.

The TSD of the MIPEL is the implementation arm of the GOSL charged with the implementation of construction projects under the Public Sector Investment Program. The TSD undertakes all aspects of project management from Initiating to Closing.

2.2.2 Project Management

Civil Engineering projects form a core aspect of Developmental projects as they affect large sections of the population in any country. Roads, Bridges, Buildings, Airports, etc. as civil engineering projects play a major role in providing very essential services to civilians. In many cases, very large sums of money are invested to implement those projects. To ensure success, these projects must be adequately managed and that is where the science of Project Management comes in.

According to pmi.org (What is project management?) “Project management, then, is the application of knowledge, skills, tools, and techniques to project activities to

meet the project requirements. It has always been practiced informally, but began to emerge as a distinct profession in the mid-20th century". PMI's A Guide to the Project Management Body of Knowledge (PMBOK® Guide) identifies its recurring elements:

Project management processes fall into five groups:

1. Initiating
2. Planning
3. Executing
4. Monitoring and Controlling
5. Closing

Project management knowledge draws on ten areas:

1. Integration
2. Scope
3. Time
4. Cost
5. Quality
6. Procurement
7. Human Resources
8. Communications
9. Risk Management
10. Stakeholder Management

All management is concerned with these, of course. However, project management brings a unique focus shaped by the goals, resources and schedule of each project. The value of that focus is proved by the rapid, worldwide growth of project management.

According to the Association for Project Management (2019) "A key factor that distinguishes project management from just 'management' is that it has this final

deliverable and a finite timespan, unlike management which is an ongoing process. Because of this a project professional needs a wide range of skills; often technical skills, and certainly people management skills and good business awareness".

The association further goes on to say that the core components of project management are:

- Defining the reason why a project is necessary;
- Capturing project requirements, specifying quality of the deliverables, estimating resources and timescales;
- Preparing a business case to justify the investment;
- Securing corporate agreement and funding;
- Developing and implementing a management plan for the project;
- Leading and motivating the project delivery team;
- Managing the risks, issues and changes on the project;
- Monitoring progress against plan;
- Managing the project budget;
- Maintaining communications with stakeholders and the project organisation;
- Provider management;
- Closing the project in a controlled fashion when appropriate.

When do you use project management?

Projects are separate from business-as-usual activities, requiring people to come together temporarily to focus on specific project objectives. As a result, effective teamwork is central to successful projects.

Project management is concerned with managing discrete packages of work to achieve specific objectives. The way the work is managed depends upon a wide variety of factors.

The scale, significance and complexity of the work are obvious factors: relocating a small office and implementing a road project such as FAARP-II share many basic principles, but offer very different managerial challenges.

Objectives may be expressed in terms of:

- Outputs (such as a fully rehabilitated road);
- Outcomes (ease of transportation of goods for farmers);
- Benefits (such as reduced travel time and reduced crop damage during transportation);
- Strategic objectives (Reduction in the number of farmers abandoning their farms).

Why do we use project management?

Project management is essentially aimed at producing an end product that will effect some change for the benefit of the organisation that instigated the project. It is the initiation, planning and control of a range of tasks required to deliver this end product. FAARP-II requires formal management because it:

- Produces something new or altered, tangible or intangible;
- Has a finite timespan: a definite start and end;
- Is complex in terms of work or groups involved;
- Requires the management of change;
- Requires the management of risks.

Investment in effective project management for FAARP-II will have a number of benefits, such as:

- Providing a greater likelihood of achieving the desired result;
- Ensuring efficient and best value use of resources;
- Satisfying the differing needs of the project's stakeholders.

The initiation, planning, execution, monitoring and controlling and closing phases for the elaboration of the Project Management Plan will occur during the development of the Final graduation Project (FGP), in accordance with the sequential progression of each subsidiary seen in figure 5 in the next subsection.

2.2.3 Project Life Cycle

The project life cycle is one of the most important concepts in project management. The Project Life Cycle refers to the four-step process that is followed by nearly all project managers when moving through stages of project completion. It provides the basic framework for managing the project. This basic framework applies regardless of the specific project work involved.

According to the Project Management Institute, the project life cycle is critical for any manager hoping to deliver projects to clients successfully. The steps involved are as follows:

- Phase 1: The Conceptualization Phase (Initiation stage)
- Phase 2: The Planning Phase
- Phase 3: The Execution Phase
- Phase 4: The Termination Phase (Closing)

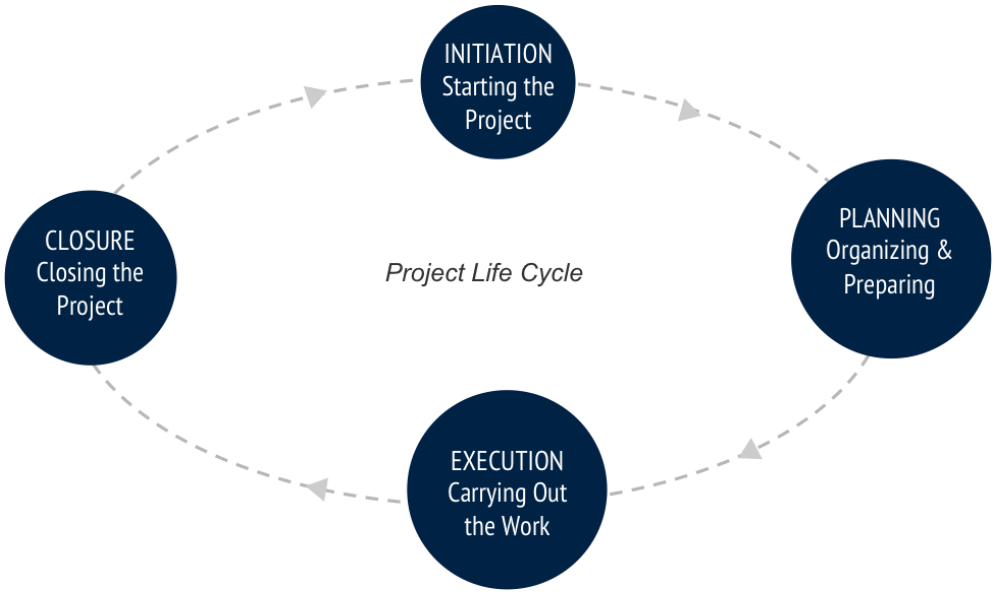


Figure 5 Project Life Cycle. (Source mavenlink.com-What is the Project Life Cycle?)

All major projects of the Technical Services Department of the MIPEL go through these four very important stages of Initiation, Planning, Execution and Closure. Monitoring and Evaluation is a continuous process, which covers all the other process groups.

The PMBOK® Guide states, “The project life cycle is managed by executing a series of project management activities known as project management processes. Every project management process produces one or more outputs from one or more inputs by using appropriate project management tools and techniques. The output can be a deliverable or an outcome. Outcomes are an end result of a process” (PMI, p.22, 2017).

Phase 1: The Conceptualization Phase

This can also be referred to as the ‘Initiation Phase’ and is the starting point of any project or idea. For the Conceptualization Phase to begin, a strategic need for the project or service must be recognized by upper management.

The Conceptualization Phase typically involves:

- Creation of the statement of work (SOW).
- Presenting the business case.
- Creation of a business contract.

Phase 2: The Planning Phase

The second phase of the project management life cycle is referred to as the Planning Phase. Once management has given the OK to launch a project, a more formal set of plans—outlining initial goals—is established.

The Planning Phase typically involves:

- Determining resource availability.
- Creating a project budget.
- Beginning to allocate tasks to certain resources.

Phase 3: The Execution Phase

The third phase is labelled Execution. This is when the actual work of the project is performed. Required materials, tools, and resources are transformed to reach the project goals. During this phase, performance is continually measured to ensure the project is successful.

The Execution Phase typically involves:

- Strategic planning.
- Implementation planning.

Phase 4: The Termination Phase

The fourth and final phase is called Termination Phase, also referred to as Project Closure. This phase begins once the project has been completed.

The Termination Phase typically involves:

- The disbandment of the project team.
- Personnel and tools are reassigned to new duties.
- Resources released back to parent organization.
- Project transferred to intended users.

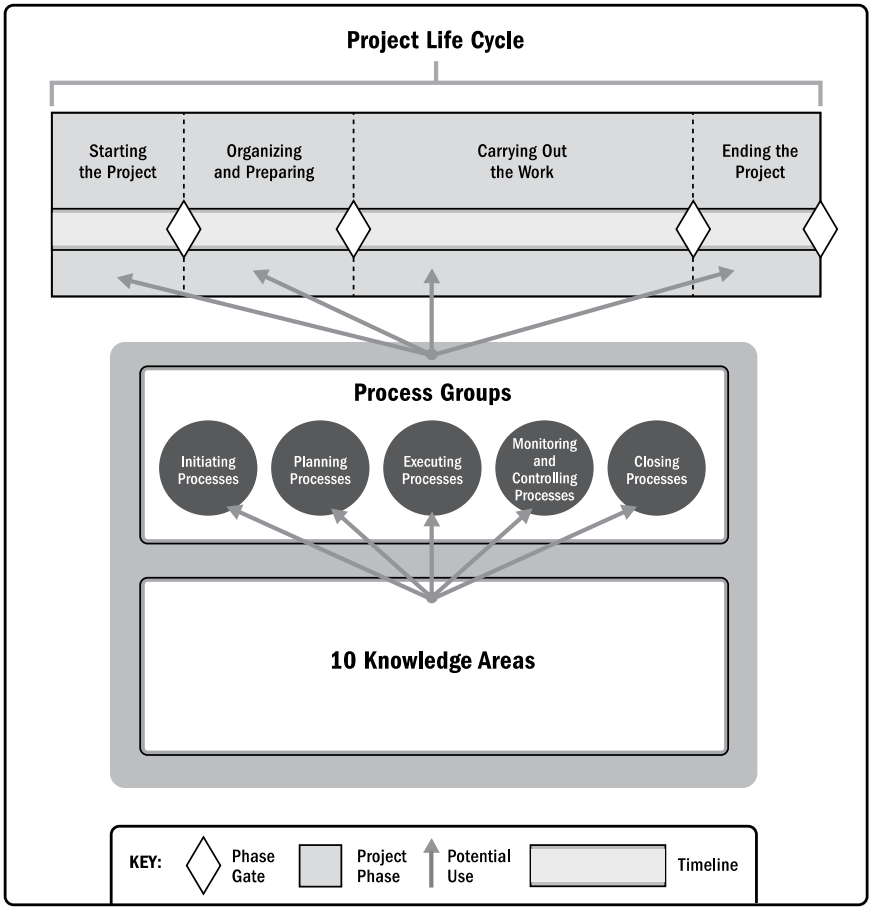


Figure 6 Interrelationship of PMBOK® Guide Key Components in Projects-Showing Project Life Cycle (Source PMI, p.18, 2017)

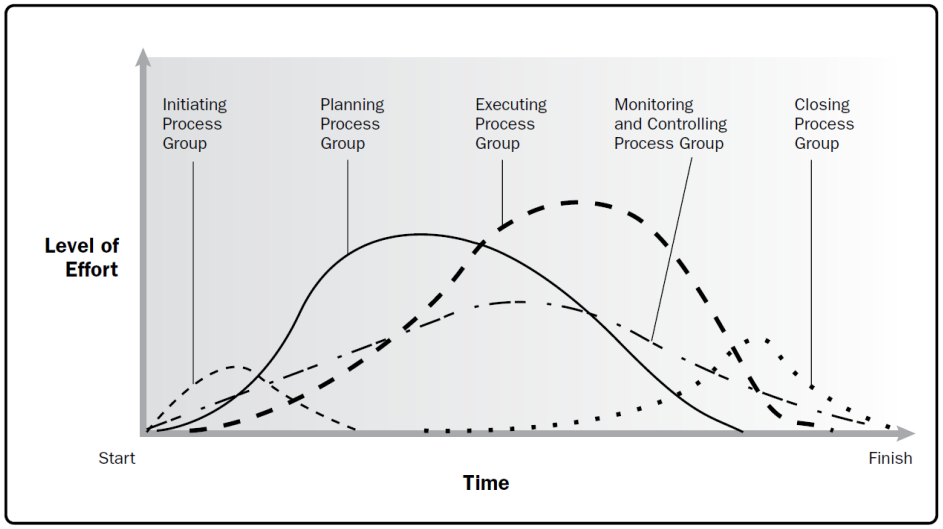


Figure 7: Process Groups Interact in a Phase or Project (Source PMI, p.555, 2017)

2.2.4 Project Management Processes

The PMBOK® Guide defines a process as “a set of interrelated actions and activities performed to create a pre-specified product, service or result.” It goes on to say that “project management processes ensure the effective flow of the project throughout its life cycle.” Processes get things done.

Each process has pre-requisites (known as inputs), tools and techniques you can use to actually do the process, and then outputs: one of more things that you get as a result of having done the process. The achievement of those things lets you know the process is over. Every project needs 5 Process Groups

According to the PMBOK® Guide (PMI, p.25, 2017), the Process Groups are:

1. Initiating

   These processes help you define a new piece of work – either a completely new project or the phase you are about to begin. They ensure you have authority to proceed.

2. Planning

   These processes help you define objectives and scope out the work to be done. They also encompass all the work around planning and scheduling tasks. Again, they can cover a complete project or just the phase you are working on right now. Or you might be closing one phase and planning the next in parallel.

3. Executing

   You do these processes as you carry out your project tasks. This is the ‘delivery’ part of project management, where the main activity happens and you create the products.

4. Monitoring and Controlling

   These processes let you track the work that is being done, review and report on it. They also cover what happens when you find out the project isn't following the agreed plan, so change management falls into this Process Group. You'll run these processes alongside those in the Executing Group (mainly, but alongside the other Groups too) so you monitor as you go.

5. Closing

   Finally, these processes let you finalize all the tasks in the other Groups when you get to the point to close the project or phase.

These process Groups are not executed in a neat, linear order. That doesn't happen in real life. On a project one will spend time in each Process Group and then maybe go round again during the next phase. Monitoring and Controlling happens from Day 1 – it ramps while the project is in the delivery phases but it goes on throughout. You can close a particular activity at any point, not just at the end of the project.

The Process Groups are not the same thing as a project life cycle. A life cycle shows how the project moves from start to finish in different phases. Within one phase one might go through all the Process Groups, or just some of them. They ought not to be confused.

2.2.5 Project Management Knowledge Areas

According to the *PMBOK® Guide* (PMI, p.25, 2017), there are ten project management knowledge areas. They are:

1. Project Integration Management
2. Project Scope Management
3. Project Schedule Management
4. Project Cost Management
5. Project Quality Management

6. Project Resource Management
7. Project Communications Management
8. Project Risk Management
9. Project Procurement Management
10. Project Stakeholder Management.

Each Area represents a complete area of specialization including jargon, tools, concepts and tasks. The Knowledge Areas are a handy way to group together theory and practical techniques. They link up the major themes or professional fields that a project manager has to operate in to get a project done.

Chart 1 Project Management Process Group and Knowledge Area Mapping (Source-PMI, p.25, 2017)

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	

2.2.5.1 Project Integration Management

This knowledge area contains the tasks that hold the overall project together and integrate it into a unified whole.

“Project Integration Management 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. In the project management context, integration includes characteristics of unification, consolidation, communication, and interrelationship. These actions should be applied from the start of the project through completion” (PMI, p. 69, 2017).

Project Integration Management includes making choices about:

- Resource allocation,
- Balancing competing demands,
- Examining any alternative approaches,
- Tailoring the processes to meet the project objectives, and
- Managing the interdependencies among the Project Management Knowledge.

The processes involved in Project Integration Management are briefly defined below.

1. **Develop Project Charter.** One of only two processes during the Initiation phase, the development of a project charter initiates the project and authorizes the project manager.
2. **Develop Project Management Plan.** This is the primary guiding document for the project manager and end result of the planning phase. It is used to ensure a successful outcome to the project. The project management plan is distributed and approved by relevant stakeholders, particularly the project sponsor, and changes are tracked through the change log.
3. **Direct and Manage Project Work.** This process encompasses the production of the project’s deliverables.

4. **Manage Project Knowledge.** Most projects require the acquisition of additional knowledge. This requires active management to ensure the project finishes on time and budget.
5. **Monitor and Control Project Work.** This process contains the work necessary to monitor the project, perform earned value analysis and project status reports, and identify potential project changes.
6. **Perform Integrated Change Control.** In this process the change control is carried out. Whether the project requires change request forms, project sponsor approvals, and other administration or if it's a basic change log, this process manages project changes.
7. **Close Project or Phase.** This process contains the tasks necessary to close the project, or the project phases.

An overview of the processes and activities of Project Integration Management is given in the figure 8 below.

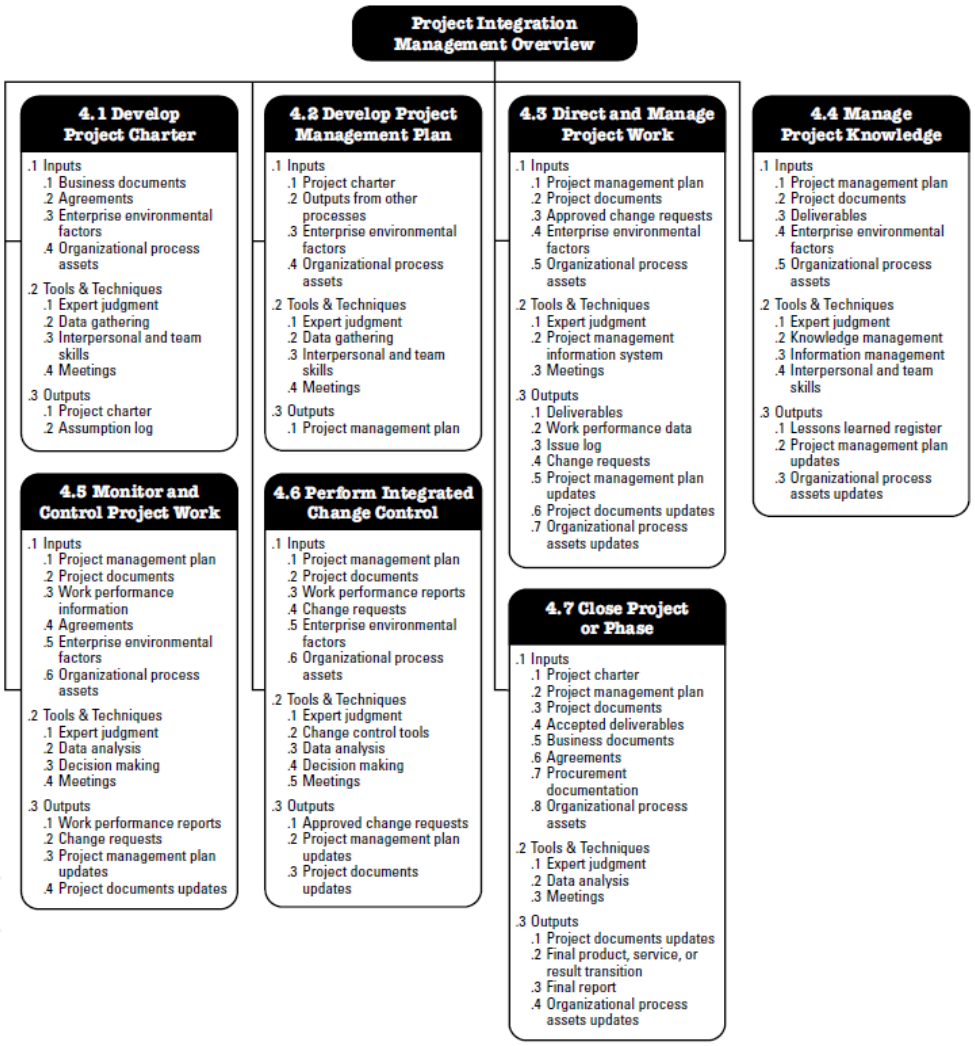


Figure 8: Project Integration Management Overview (PMI, p. 71, 2017)

According to PMI, 2017 (p.72) Project Integration Management is about:

Ensuring that the deliverable due dates of the product, service, or result; project life cycle; and the benefits management plan are aligned;

Providing a project management plan to achieve the project objectives;

Ensuring the creation and the use of the appropriate knowledge to and from the project as necessary;

Managing the performance and changes of the activities in the project management plan;

Making integrated decisions regarding key changes impacting the project;

Measuring and monitoring the project's progress and taking appropriate action to meet project objectives;

Collecting data on the results achieved, analysing the data to obtain information, and communicating this information to relevant stakeholders;

Completing all the work of the project and formally closing each phase, contract, and the project as a whole; and

Managing phase transitions when necessary.

Process 1 (or 4.1 in figure 8 below) will be used to develop the project charter that will begin the development of the Project Management Plan for FAARP-II. Process 2 (or 4.2 in figure 8) will be used as a guide throughout the elaboration of the FGP results to develop the Project Management Plan.

2.2.5.2 Project Scope Management

"Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. Managing the project scope is primarily concerned with defining and controlling what is and is not included in the project" (PMI, p. 129, 2017).

This knowledge area involves the work that is included within the project. Since scope changes are one of the top causes of project changes and grief in general, it is very important that the boundaries of the project be well defined from the outset and monitored rigorously. It is very easy for people to insert unauthorized work into the project when the project appears to be big enough to absorb it, but most projects are estimated with the minimum cost. Interestingly when competing for (or obtaining) work, we are motivated towards the minimum scope. But when the project has begun, we are motivated towards the maximum.

The Project Scope Management processes are:

1. **Plan Scope Management.** The Scope Management Plan is part of the project management plan and can be a section within it rather than a standalone document.
2. **Collect Requirements.** At this stage the detailed requirements of the final product or service are assembled and itemized.
3. **Define Scope.** A scope statement is created which can be in sentence form or bulleted. Every project boundary cannot be delineated, but the scope statement should be comprehensive enough that it reduces some of the major risks to the project.
4. **Create WBS.** A Work Breakdown Structure (WBS) contains either a graphical or table-style breakdown of the project work.
5. **Validate Scope.** During the project the deliverables are "validated" meaning they are approved by the recipient. Note this appears during the Monitoring & Controlling process group, and it refers to the formal acceptance of the deliverables after they have been submitted, not the specifications for the deliverables during the planning phase.
6. **Control Scope.** The scope statement must be revisited regularly in light of the project work that has been completed and current project status. If behind schedule, for example, the project manager may wish to gravitate toward a minimum acceptable scope rather than all the bells and whistles you wanted to produce in the beginning.

An overview of the processes and activities of Project Scope Management is given in the figure 9 below.

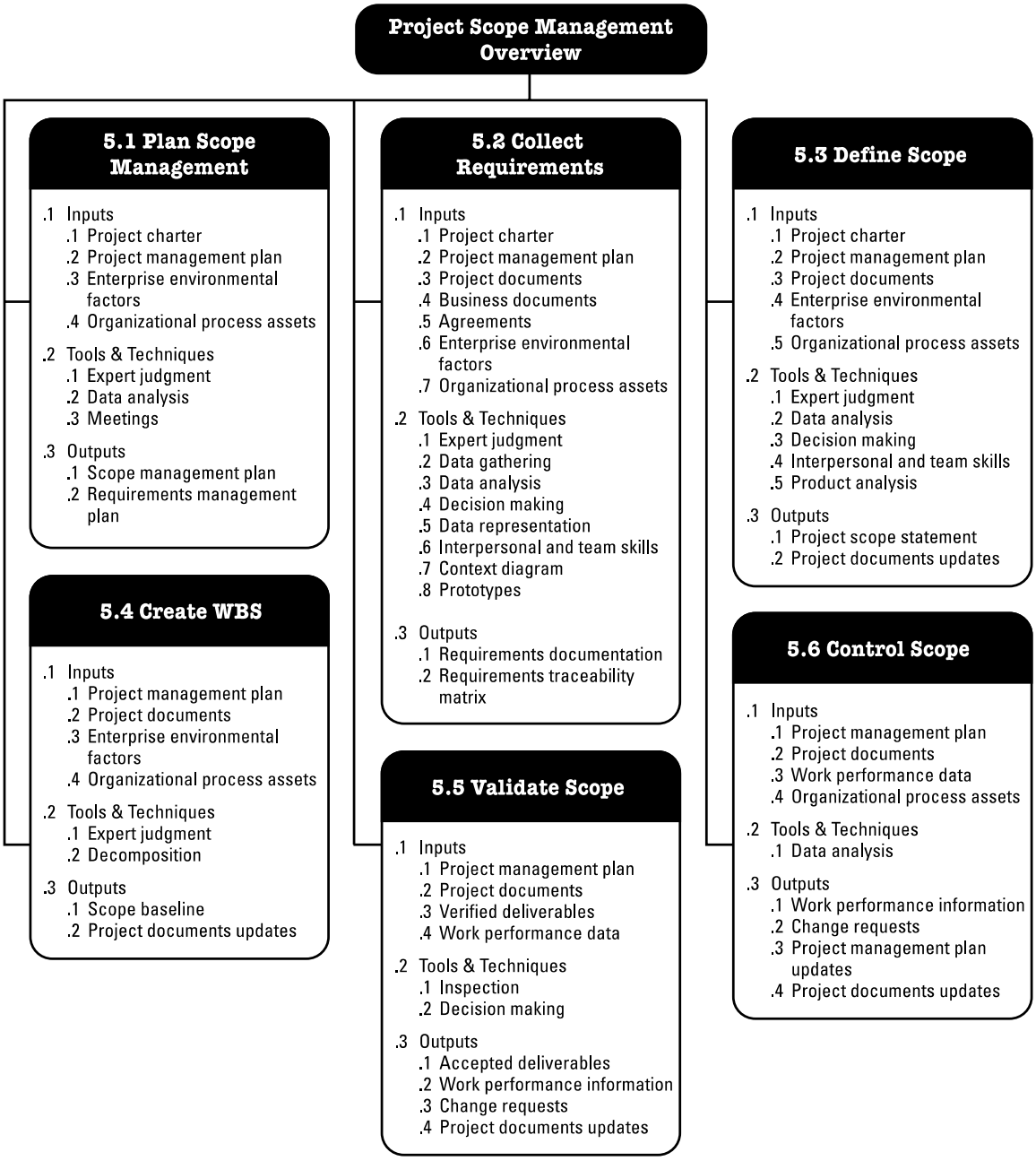


Figure 9. Project Scope Management Overview (PMI, p.129, 2017)

To elaborate the scope necessary to successfully complete the Feeder and Agricultural roads project processes 1 to 4 (or 5.1 to 5.4 of figure 9) will be applied when formulating the Project Management Plan.

2.2.5.3 Project Schedule Management

Project Schedule Management includes the processes required to manage the timely completion of the project. It includes the management of the time spent, and progress made, on project tasks and activities. Excellent time management in project management requires the planning, scheduling, monitoring and controlling of all project activities.

The Project Scope Management processes are:

1. **Plan Schedule Management.** The Schedule Management Plan contains information such as how the schedule will be created, who will be responsible for it, how aggressive it will be, and under what circumstances it will be changed.
2. **Define Activities.** The project is divided into tasks. Note that according to the PMBOK® this process is different from Create WBS within the Scope Management knowledge area, but in practice they are generally the same. A task list is produced which defines all of the project.
3. **Sequence Activities.** The tasks are “sequenced” that is, they are ordered and the relationships between them are established. These relationships take the form of Finish-to-Start (FS), Finish-to-Finish (FF), Start-to-Start (SS) and Start-to-Finish (SF).
4. **Estimate Activity Durations.** Using its resource list, a duration is estimated for each task.
5. **Develop Schedule.** Firstly, a network diagram is produced which determines the critical path as well as floats for each task. Secondly, a graphical bar chart schedule is created with each activity plotted on their early start dates. Lastly the resource usage is plotted and tasks are moved along their floats to flatten the resource usage. This is called resource levelling.
6. **Control Schedule.** Earned value analysis is performed on regular project status intervals to determine whether the project is ahead or behind schedule, and by how much, at that status point.

An overview of the processes and activities of Project Schedule Management is given in the figure 10 below.

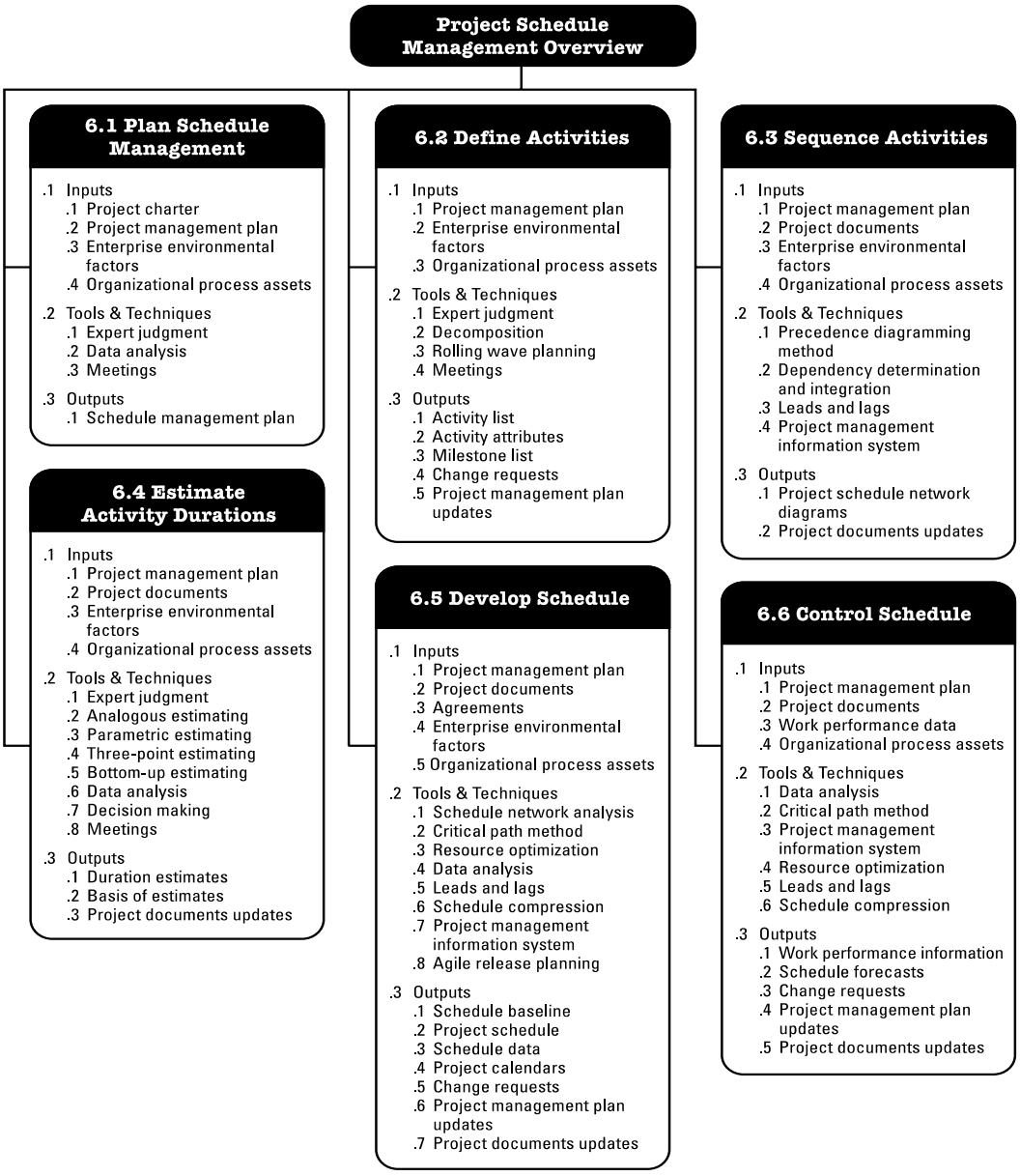


Figure 10. Project Schedule Management Overview (PMI, p. 214, 2017)

Processes 1 to 5 (or 6.1 to 6.5 in the above figure 10) will be used to create the Schedule Management Plan, Schedule Baseline, Project Schedule and Project Calendars for FAARP-II.

2.2.5.4 Project Cost Management

Project cost management in the context of FAARP-II is of significance as cost is one of the triple constraints when it come to the successful implementation of projects. According to the Project Management Institute:

“Project Cost Management is of vital importance to a construction project's success as it impacts the organization's profitability. Project Cost Management entails managing the day-to-day project costs and poses unique challenges due to the multitude of stakeholders. Estimating and budgeting occur within the Planning Process Group. Estimates are very important, because decisions to proceed with a project are based on cost estimates. Cost estimates vary depending on the size of construction projects, from a single-page high-level estimate to a detailed estimate containing thousands of line items. Risk analysis should be performed to develop project contingency. Most diagnosed risks in construction have a financial or cost impact” (PMI, p.37, 2016).

The processes making up the project cost management knowledge area are:

1. **Plan Cost Management.** The Cost Management Plan establishes things like the methodologies with which the project budget will be established, the criteria for changes, and control procedures.
2. **Estimate Costs.** The cost of each task is estimated, taking into account the resources, labour, materials, equipment, and any other item of cost necessary to complete the task.
3. **Determine Budget.** The task budgets are rolled up into an overall project budget.

4. **Control Costs.** Earned value analysis is performed on regular project status intervals to determine the project status at that status point.

These processes are illustrated in figure 11 below. To develop the project management plan for FAARP-II, processes 1 to 3 (or 7.1 to 7.3 as illustrated in the figure 11 below) will be used.

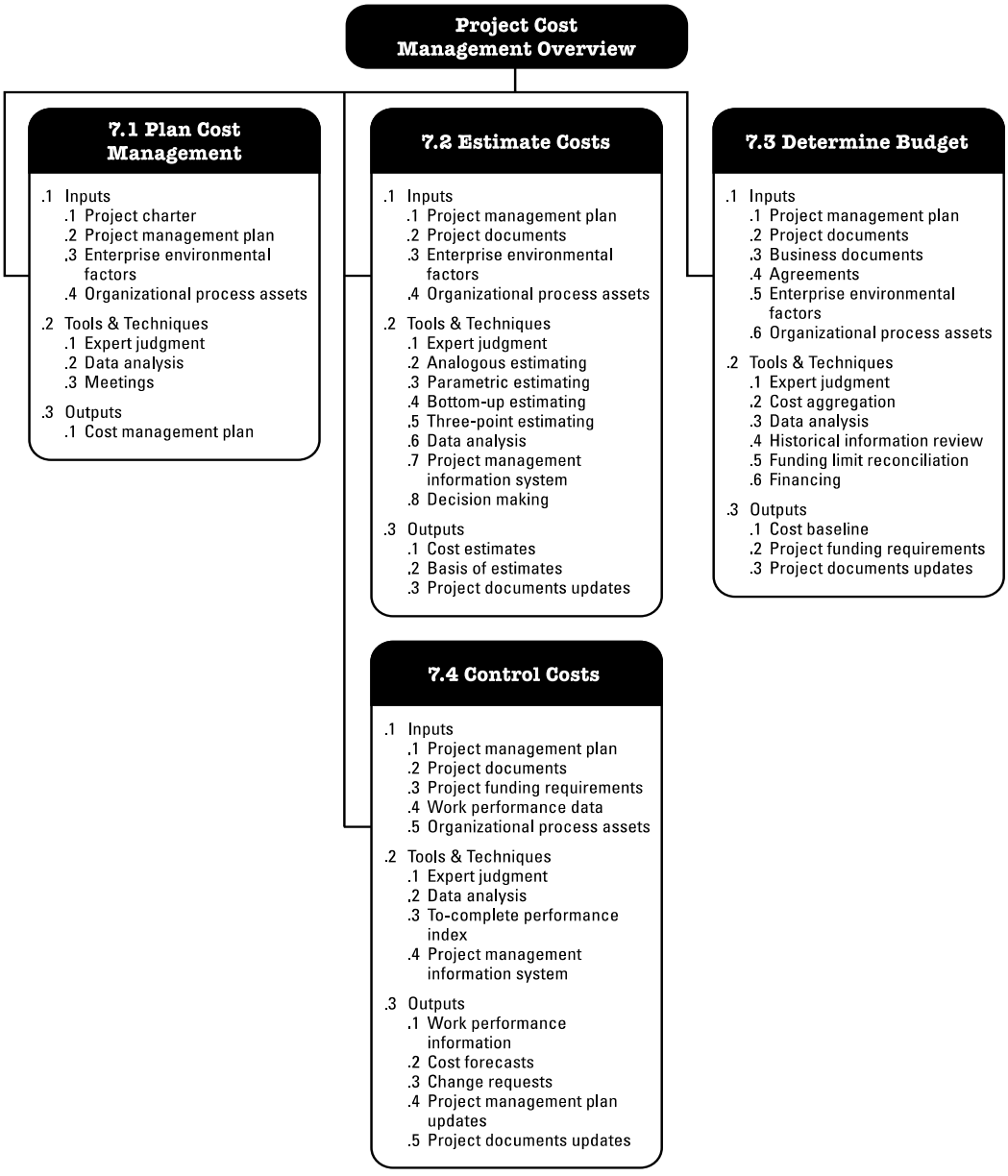


Figure 11. Project Cost Management Overview (PMI, p. 232, 2017)

2.2.5.5 Project Quality Management

Quality is paramount when it comes to project success and adequate planning is required at this level to ensure satisfaction of all stakeholders. As spelt out by the Project Management Institute:

“Project Quality Management seeks to satisfy the owner's needs as outlined in the contract requirements and specifications. It is integral to risk, safety, and environmental management, and applies to all attributes of project management. For construction projects, Project Quality Management manages both the process and the product. Project Quality Management is critical to all projects, with critical impacts to construction projects.

The Planning Process Group reviews construction-specific documents that outline quality standards that are required to be met for the project to be successful, including contracts, construction documents, and specifications.

The Executing Process Group discusses quality compliance audits and quality technical audits that may require licensed or certified professionals to achieve project requirements and objectives.

The Monitoring and Controlling Process Group for construction projects may include conformance reports to validate quality or require rework. Rework can have a significant impact on a project's cost and schedule. The sooner nonconforming work is identified, the lesser the impact, and the sooner preventive actions can be established to eliminate non-conformance. Preventive measures should be established in the planning phase to address known risks pertaining to non-conformance”. (PMI, p. 37, 2016).

According to PMBOK® Guide (PMI, p. 271, 2017) the project quality management processes are:

1. Plan Quality Management— the process of identifying quality requirements and/or standards for the project and its deliverables, and documenting how the project will demonstrate compliance with quality requirements and/or standards.

2. Manage Quality— the process of translating the quality management plan into executable quality activities that incorporate the organization's quality policies into the project.

3. Control Quality— the process of monitoring and recording the results of executing the quality management activities to assess performance and ensure the project outputs are complete, correct, and meet customer expectations.

Figure 12 below provides an overview of the Project Quality Management processes. Only process 1 (8.1 as illustrated in the figure 12 below) will be used during project management planning to produce the quality management plan that will guide the FAARP-II Quality Assurance.

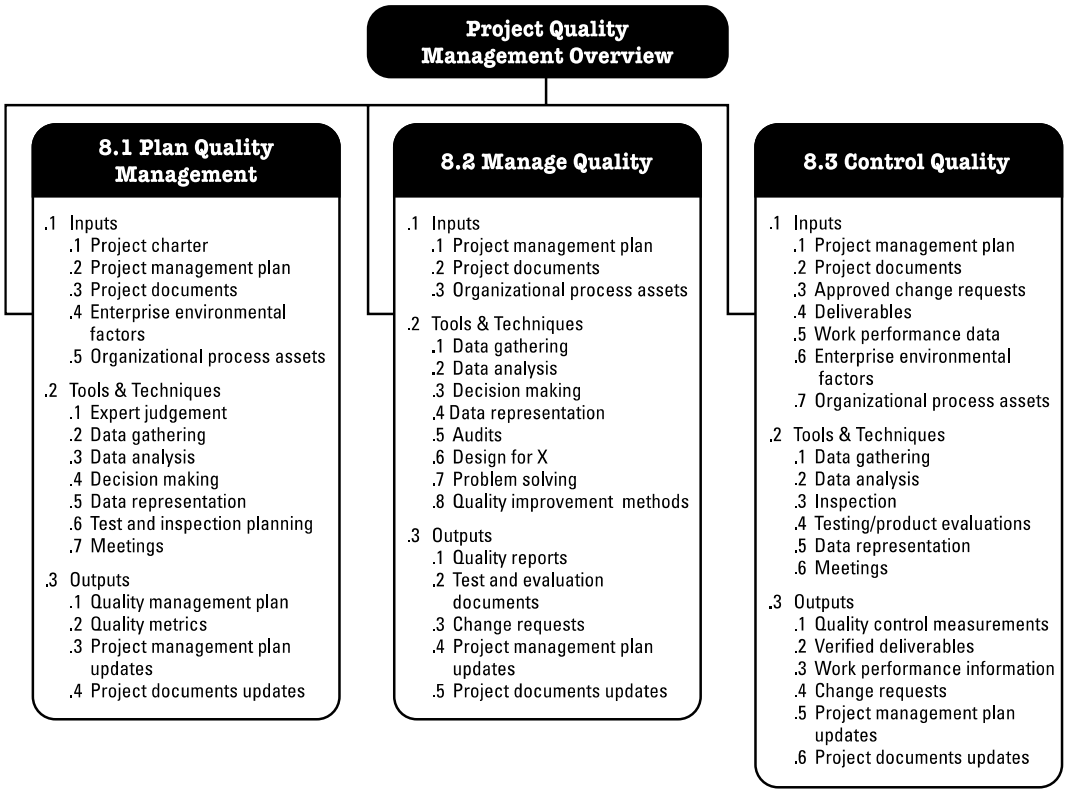


Figure 12. Project Quality Management Overview (PMI, p. 232, 2017)

2.2.5.6 Project Resource Management

For project success, it is essential to adequately plan for all resources and not just human. The Project Management Institute states that:

“Construction projects utilize a variety of resources, such as human resources, machinery and tools, equipment and bulk materials, and others. Factors such as project site location, type, and size should be taken into account when mobilizing, utilizing, and demobilizing resources”.

Project Resources Management includes aspects such as acquiring, handling, storing, and monitoring validity terms for particular goods, as well as staffing, team building, and honing interpersonal skills.

The human resources who manage and execute project activities manipulate other resources in order to build the product of the project. The volume of resources required and the time required for their manipulation are key factors for achieving time and cost objectives. Thus, productivity rates and resource consumption rates are planned and actively monitored and controlled.

When the project reaches the end phase, all remaining resources—people, equipment, and materials—are demobilized. The demobilization phase can be expensive and time-consuming. When not taken into account during the early stages of project time and cost planning, demobilization can turn a project result from success into failure from a business point of view". (PMI, p.37, 2016)

The processes that make up this knowledge area can be detailed as follows:

1. **Plan Resource Management.** The Human Resource Management Plan identifies the roles/positions required by the project, the minimum requirements for those roles, and how they fit into the overall project structure.
2. **Estimate Activity Resources.** To ensure the necessary resources are available, the quantity of each resources needs to be estimated.
3. **Acquire Resources.** Once the required number of resources has been estimated, the resources can be acquired.
4. **Develop Team.** The project team often requires training to develop the necessary competencies to complete the project, but the development of the team environment and interaction between team members is also actively managed.
5. **Manage Team.** The project team is actively managed to ensure their production is maximized and they are satisfied.
6. **Control Resources.** The resources are monitored and their performance evaluated to ensure maximum productivity.

These process groups are illustrated in figure 13 below. Only process 1 (or 9.1 as per the figure 13 below) will be developed during the project management exercise for FAARP-II in order to formulate the project resource management plan.

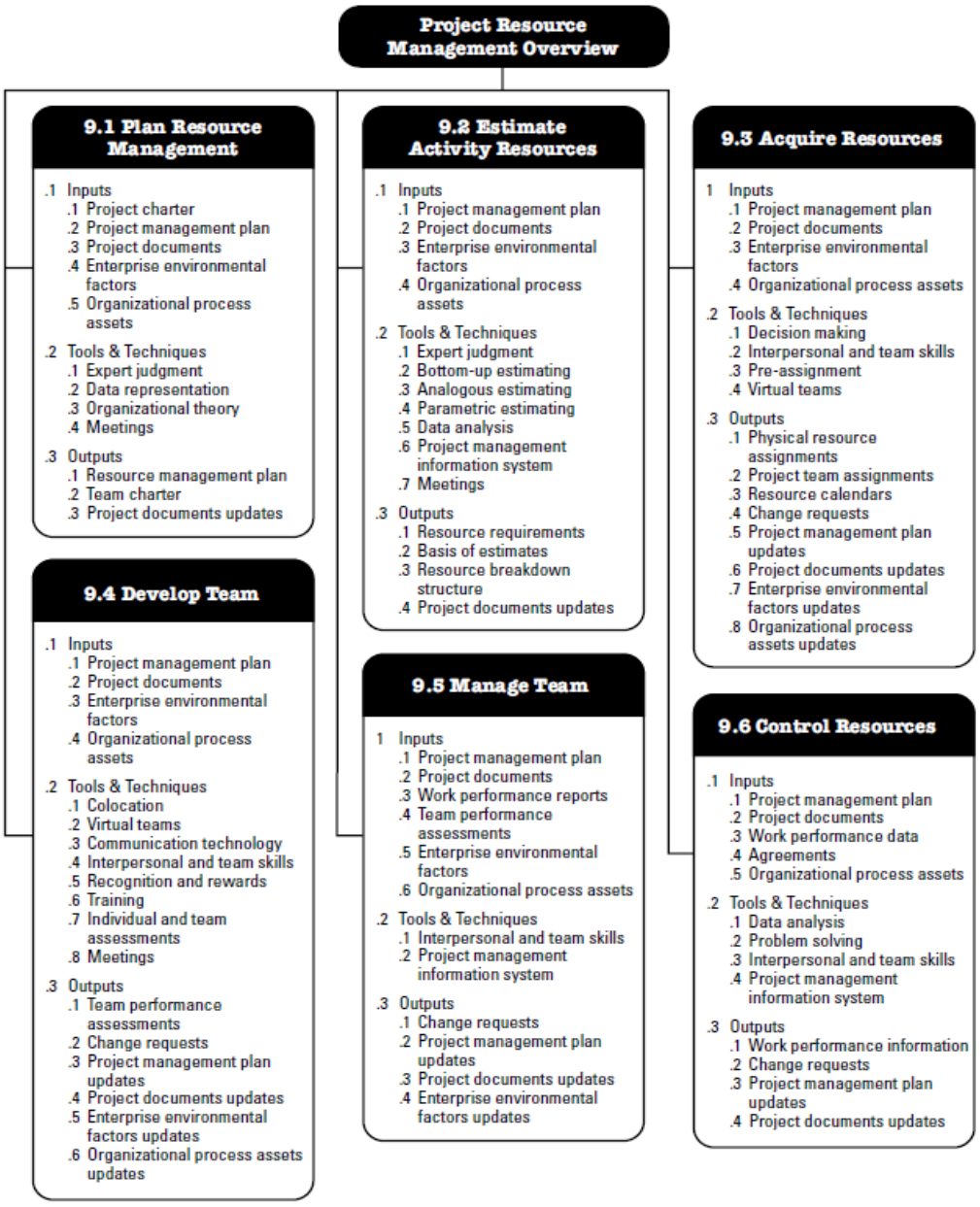


Figure 13. Project Resource Management Overview (PMI, p. 308, 2017)

2.2.5.7 Project Communications Management

According to the Project Management Institute “Project Communications Management includes the processes necessary to ensure that the information needs of the project and its stakeholders are met through development of artefacts and implementation of activities designed to achieve effective information exchange. Project Communications Management consists of two parts. The first part is developing a strategy to ensure communication is effective for stakeholders. The second part is carrying out the activities necessary to implement the communication strategy.” (PMI, p. 359, 2017)

The Project Communications Management processes are:

1. **Plan Communications Management.** The Communications Management Plan identifies the regular communication requirements of each stakeholder, such as investor circulars, progress updates, and so forth. It also identifies any specific communications procedures for unexpected issues or project changes.
2. **Manage Communications.** During project execution the communications plan is put into practice and communications are actively managed.
3. **Monitor Communications.** During regular status points the project communications are reviewed and revisions to the communications plan are initiated.

Refer to figure 14 below for a graphical overview of the processes that make up this knowledge area.

The communications plan which constitutes an integral part of the project management plan for FAARP-II will be developed using process 1(or 10.1 as detailed in the figure 14 below).

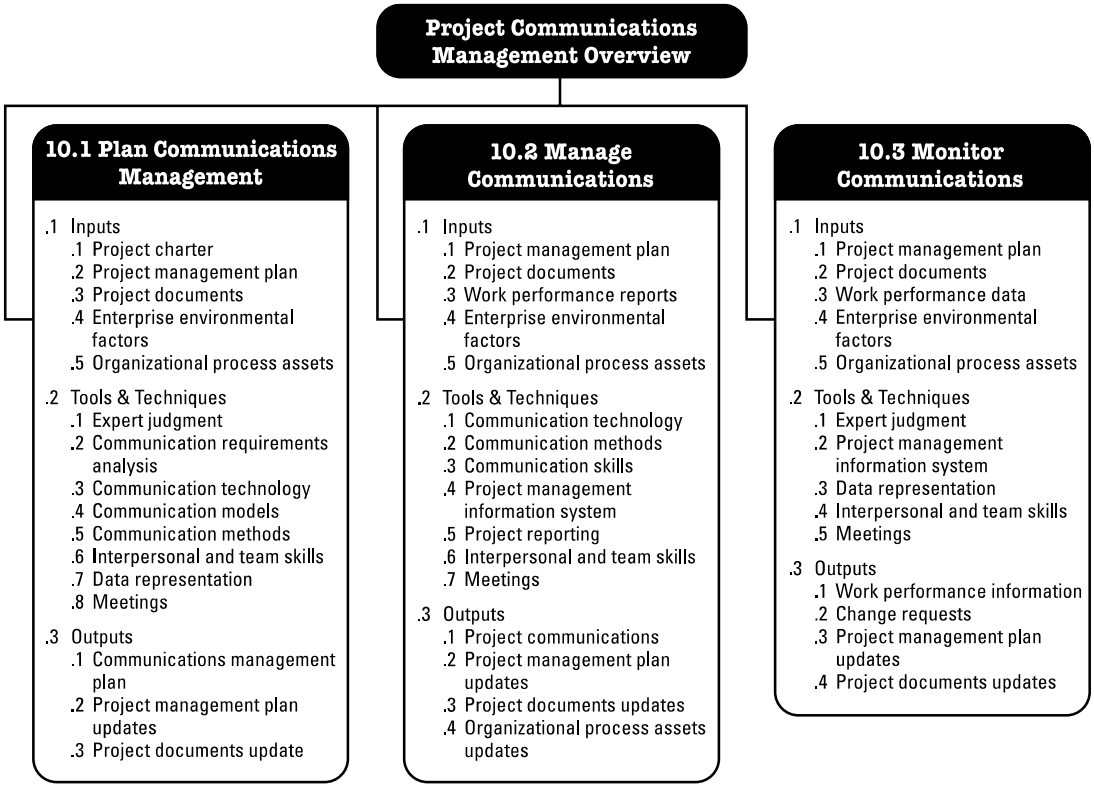


Figure 14. Project Communications Overview (PMI, p. 360, 2017).

2.2.5.8 Project Risk Management

Managing project risk is one of the most underrated aspects of project management. Major risks are very seldom identified up front and analysed within the project management plan, but when they are, project stakeholders tend to forgive the unexpected issues much quicker. Not to mention they hold the project manager in high regard for strong safeguarding of their investments.

According to the project management Institute “Project risk management includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project. The objectives of project risk management are to increase the probability and/or impact of positive risks and to decrease the probability and/or impact of negative risks, in order to optimize the chances of project success”. (PMI, p.395, 2017).

Project risk management comprise the following processes:

1. **Plan Risk Management.** The Risk Management Plan identifies how the risks will be itemized, categorized, and prioritized.
2. **Identify Risks.** The major risks to the project are identified and placed into a risk register (list of risks). Most projects have one or two risk that take significant precedence over all others, and these should often get special attention.
3. **Perform Qualitative Risk Analysis.** Once the biggest risks are identified, they are classified into categories of likelihood and impact, and then ranked according to priority.
4. **Perform Quantitative Risk Analysis.** Once the risks are ranked according to priority, the biggest priority risks are numerically analysed according to their impact to the project budget, schedule, or any other part of the project.
5. **Plan Risk Responses.** For the most important risks, response plans are drafted such that all parties are aware of how to respond to the occurrence of the risk.
6. **Implement Risk Responses.** The risk responses identified in the previous step are carried out.
7. **Monitor Risks.** At regular status points the risk register is inspected and risks that have expired are crossed off.

The above processes are detailed in figure 15 below. For the purposes of developing the risk management plan for FAARP-II processes 1,2,3 and 5 (or 11.1,11.2,11.3 and 11.5 as illustrated in the figure 15 below will be used.

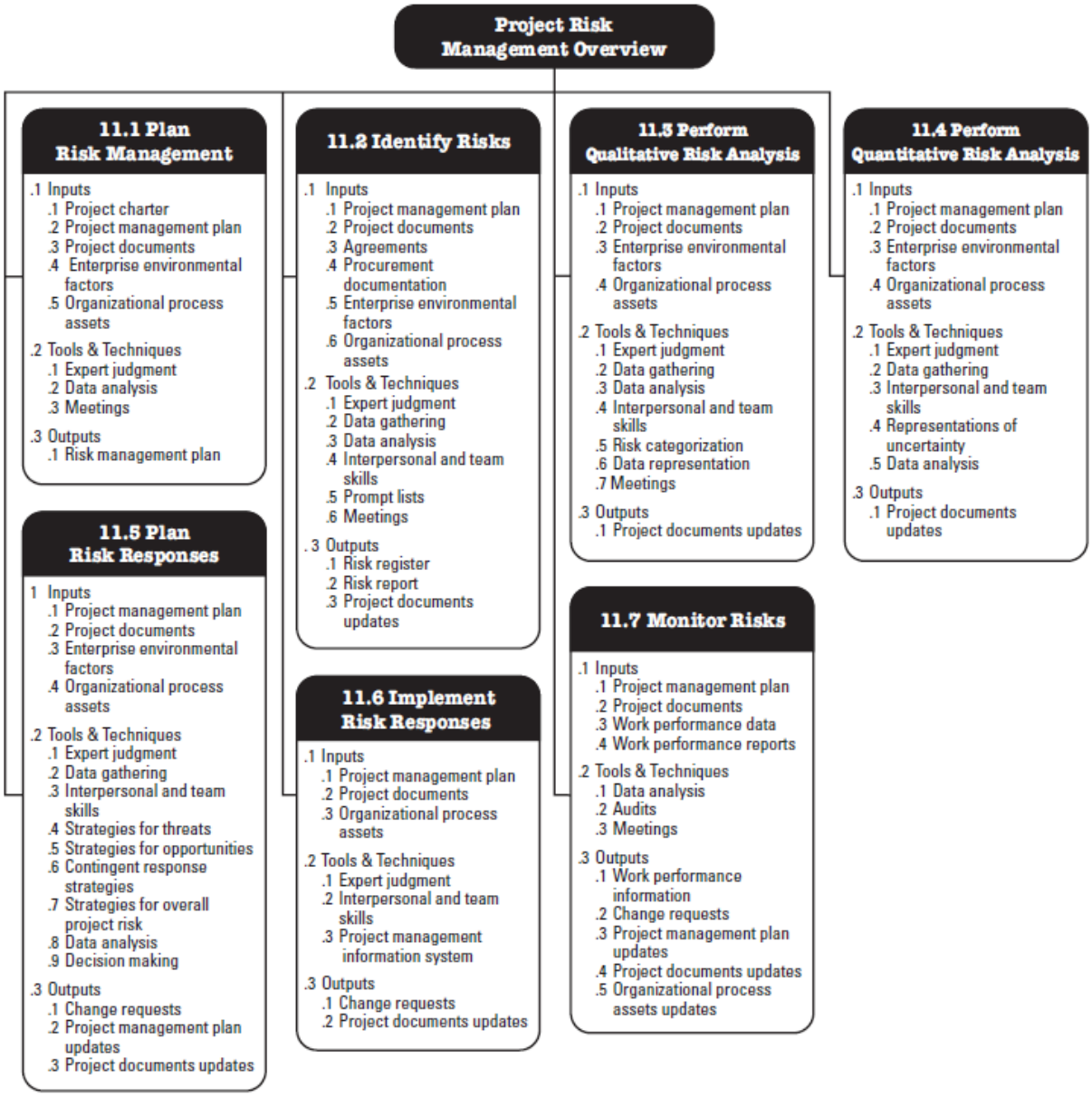


Figure 15. Project Risk Management Overview (PMI, p. 396, 2017).

2.2.5.9 Project Procurement Management.

According to the Project Management Institute:

“Construction projects are almost entirely based on the procurement of contractual arrangements between the multitude of sellers and buyers, and include the procurement of capital and project equipment and materials. Project

Procurement Management focuses on planning and executing well-defined contract agreements for specific scopes of work throughout the project life cycle. Care is needed to ensure that the proper material and equipment is delivered in a timely fashion. Planning and executing for the procurement effort in many situations will overlap with project initiating processes in order to assist the owner with the preliminary scope definition and development activities. The results from this effort lead to all other procurement for engineering, design services, and construction work, for the purpose of moving contractors, suppliers, and consultants toward achieving the owner's objectives.

Special attention is needed during planning and executing of the procurement contracts to ensure that the correct expertise and skills for the design and construction of highly integrated components are satisfied. When coupled with the large number of contractors required to perform the work, the expertise for contract administration and management quickly become the controlling factors for a successful project. Interpreting and understanding general and special conditions within contracts, procurement documents, and associated reporting requirements are a vital contract administration function.

In the Closing Process Group, as construction draws to an end, deliverables in all contracts are validated and all outstanding change requests, progress payments, and potential disputes are settled”. (PMI, p. 39, 2016).

According to the Project Management Institute, the processes comprising this knowledge area are as follows:

1. **Plan Procurement Management—** the process of documenting project procurement decisions, specifying the approach, and identifying potential sellers.
2. **Conduct Procurements—** the process of obtaining seller responses, selecting a seller, and awarding a contract.

3. **Control Procurements—** the process of managing procurement relationships, monitoring contract performance, making changes and corrections as appropriate, and closing out contracts. (PMI, 459, 2017)

The process groups are elaborated in the figure 16 below.

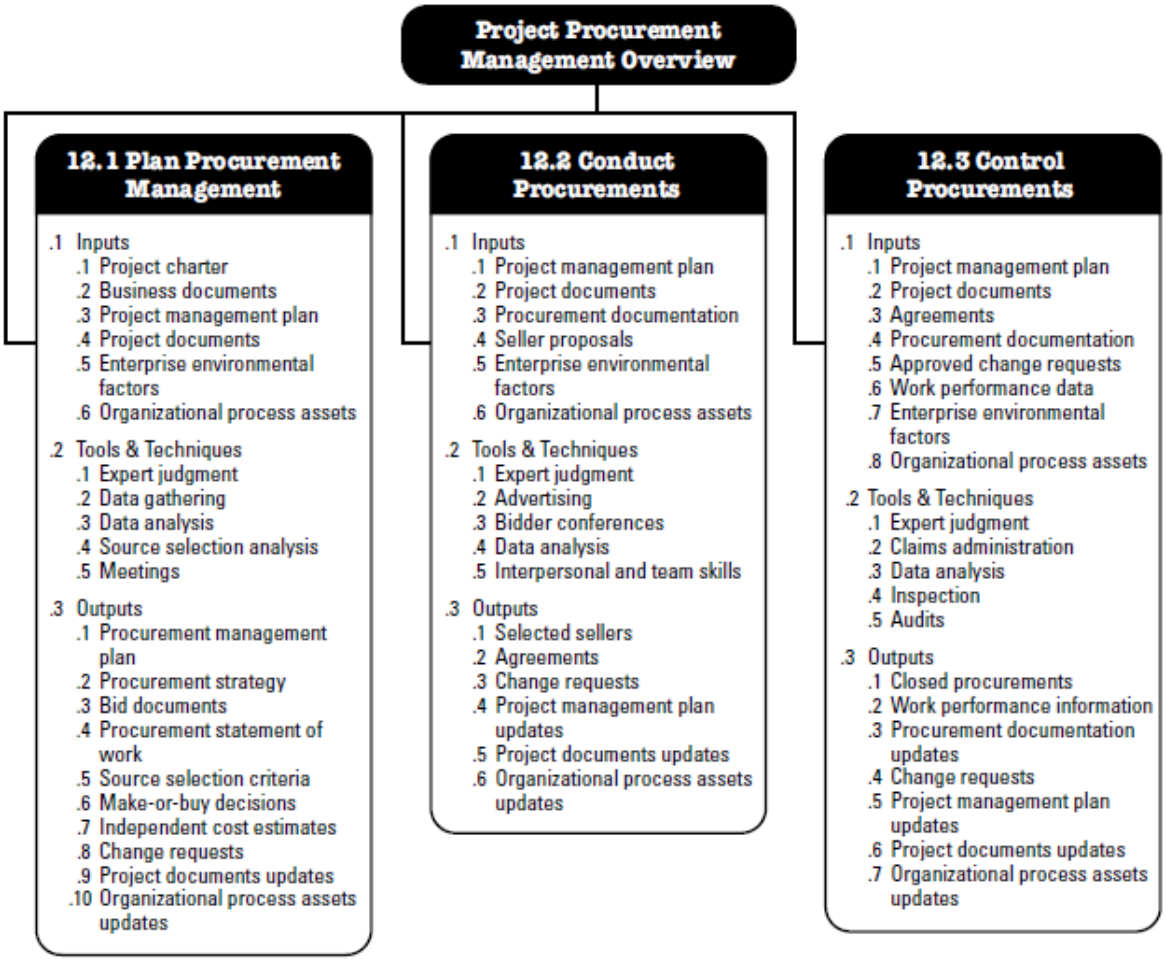


Figure 16 Project Procurement Management Overview (PMI, 460, 2017)

In developing the project managing plan, process 1 (or 12.1 as per the figure 16 above) will be used in developing the procurement management plan.

2.2.5.10 Project Stakeholder Management.

Project stakeholders are key to project success. Stakeholders should never be marginalized but should be actively managed and addressed within the project management plan.

According to the Project Management Institute:"
"Project stakeholder management includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyse stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution. The processes support the work of the project team to analyse stakeholder expectations, assess the degree to which they impact or are impacted by the project, and develop strategies to effectively engage stakeholders in support of project decisions and the planning and execution of the work of the project". (PMI, p. 503, 2017)

The project stakeholder management processes are:

1. **Identify Stakeholders.** During the project initiation phase, the major stakeholders are identified and their concerns established.
2. **Plan Stakeholder Engagement.** The Stakeholder Management Plan lists each stakeholder and prioritizes their concerns and potential impacts on the project.
3. **Manage Stakeholder Engagement.** During project execution the stakeholders must have their needs addressed and communication lines must remain open.
4. **Monitor Stakeholder Engagement.** During status reviews each stakeholder must be considered to determine if their needs are being addressed and if changes need to be made to ensure that they are.

These processes are illustrated in figure 17 below.

Processes 1 and 2 (or 13.1 and 13.2 as per the figure below) will be used in developing the project management plan.

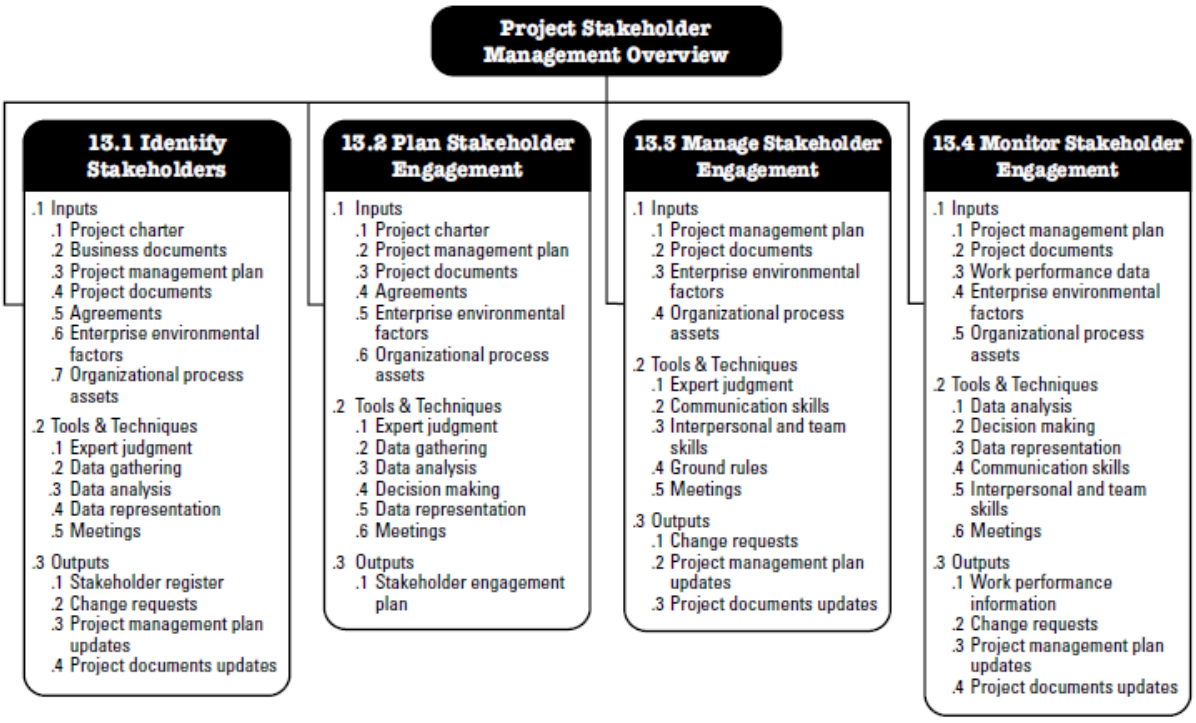


Figure 17: Project Stakeholder Management Overview (PMI, p. 504, 2017)

Other applicable theory/concepts related to the project topic and context.

2.3.1 Planning Process Group

The planning process group is integral to the development of a good project management plan. It consists of those processes performed to establish the total scope of the effort, define and refine objectives, and develop a course of action to reach goals The primary result of the planning process is an integrated project management plan which includes the scope, schedule, budget, quality, resource,

communication, risk management and procurement plans. The planning process group will be used to develop the project management plan for FAARP-II

The planning process group can be summarized as follows:

- Plan Scope Management
- Collect Requirements
- Define Scope
- Create WBS
- Project Schedule Management
- Define Activities
- Sequence Activities
- Estimate Activity Resources
- Estimate Activity Durations
- Develop Schedule
- Plan Cost Management
- Estimate Costs
- Determine Budget
- Plan Quality Management
- Plan Resource Management
- Plan Communication Management
- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitative Risk Analysis
- Plan Risk Responses
- Plan Procurement Management
- Plan Stakeholder Management

These are represented graphically below in figure 18. These will be used to detail the project management plan for FAARP-II.

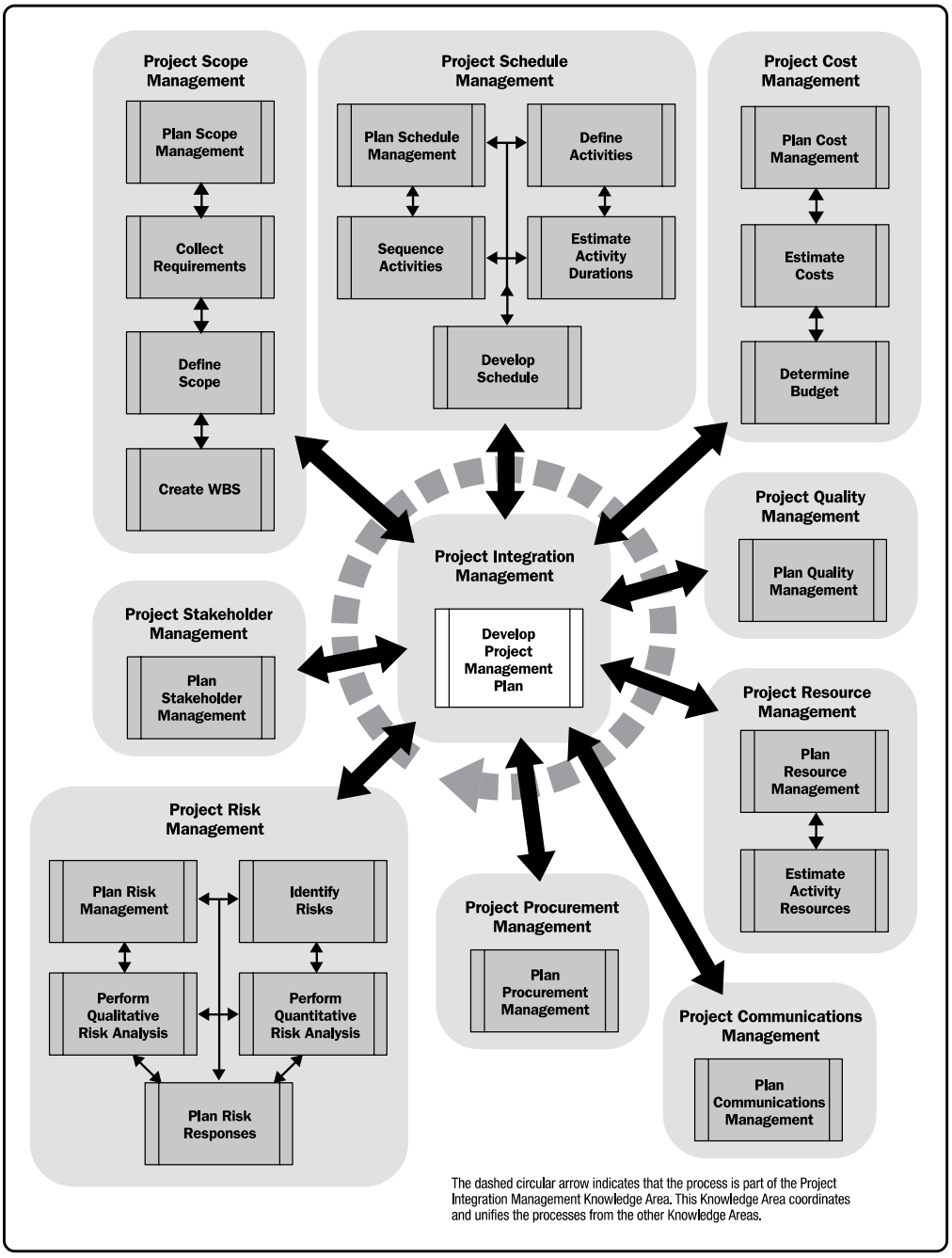


Figure 18: Planning Process Group (PMI, p. 504, 2017)

2.3.2 Project Health, Safety, Security, and Environmental Management (HSSE)

This section emphasizes health, safety, security, and environmental management for FAARP-II. Site security and controlled access are discussed for the

construction job sites. Employee health and wellness are introduced for construction personnel as these directly affect construction project risk and safety. Trends include virtual technology and environmental certifications.

While HSSE is applicable to all industries, the unique hazards in construction projects intensify the need for additional measures. The Planning Process Group includes a proactive view of health, safety, and environmental policy compliance. In addition to employee health and site security, a comprehensive health, safety, and environmental management plan is developed to address specialized stakeholders, reporting requirements, documentation and record storage requirements, training, and additional government requirements.

The Executing Process Group involves the systematic application of the health, safety, security, and environmental plans, while the Monitoring and Controlling Process Group focuses on employing a method of audits, analyses, and measurements to determine the effectiveness of the established plans for meeting regulatory and project requirements. In developing the project management plan for FAARP-II, health, safety, security and environmental management will be looked at in detail as these are of paramount importance for compliance with International Labour Organization (ILO) protocols and Environmental laws and regulations of the project country, Saint Lucia.

2.3.3 Regenerative Development and Climate Change Resilience

In the implementation of FAARP-II due attention will be made to ensure, if necessary, through redesign, that principles which speak to and embrace regenerative development and climate change resilience concepts are in cooperated into the project.

Planning processes, and to a lesser extent, building design have increasingly recognized the importance of engaging stakeholder input. Project managers need to recognize how regenerative design maintains and solidifies the need to create ‘common ground’ with diverse stakeholders and the potential that the regenerative

development process holds in this regard. But most significant is the garnering of stakeholder engagement over the long-term. Going forward, we as project managers need to recognize the critically important distinction between regenerative ‘design’ and regenerative ‘development’. While regenerative design builds the regenerative, self-renewing capacities of designed and natural systems (the designed interventions), regenerative development creates the conditions necessary for its sustained, positive evolution. Regenerative development and design do not end with the delivery of the final drawings and approvals, or even with construction of a project.

The project manager needs to put in place, during the design review and development process, what is required to ensure that the ongoing regenerative capacity of the project, and the people who inhabit and manage it, is sustained through time. Such a form of active and reflective stewardship will help build the capacities of people to design, create, operate and evolve regenerative socio-ecological systems in their place.

It is worthy to note that the benefits of regenerative design and development cannot be fully understood at the completion of a project – it will take considerable time before the necessary sustained engagement and stewardship can be gauged in a culture that is currently impatient and short-sighted. Saint Lucia like other Caribbean islands is not exempt from the effects of climate change. With intense weather systems, manifesting themselves with greater frequency there is urgent need to design or build for greater resilience. This is true for FAARP-II as a number of the identified roads are in areas with low climate vulnerability. The project design review will identify and evaluate the potential effects of climate change on the roads, the surrounding watersheds and communities, and recommend resilience measures to address the identified vulnerabilities so as to ensure adequate inclusion of designs to address risk drivers and thus mitigate or eliminate risks.

3. METHODOLOGICAL FRAMEWORK

3.1 Information Sources

According to The New Encyclopaedia Britannica, Volume 21 (Macropedia),

> ” the term information refers to facts and opinions provided and received during the course of daily life: one obtains information directly from other living beings, from mass media, from electronic data banks, and from all sorts of observable phenomena in the surrounding environment. A person using such facts and opinions generates more information, some of which is communicated to others during discourse, by instructions, in letters and documents, and through other media. Information organized according to some logical relationships is referred to as a body of knowledge, to be acquired by systematic exposure or study”. (Information Processing and information Systems, 1993, p.615)

A source is a place or person from which you can obtain something useful or valuable.

A resource is something that can be used to perform some function. The sources from where we get information are called information sources and these comprise of documents, humans, institutions as well as mass media like radio and television. Information sources are significant for information organizations and information users. This is because the sources indicate the current development in all fields, avoid duplication in research, give answers for specific queries, help us to understand some unfamiliar terms, provide meaning for terms and indicate broadened view of a subject. Information sources also provide an in-depth treatment of a topic or aspect of a topic and can also provide a broad overview or historical view of a topic. This is so because these sources are prepared after browsing wide variety of knowledge and also examine past studies to predict future trends, etc.

Information sources are different from reference sources. An information source is one, which provides us the required information. Whereas, reference sources are to obtain specific types of information which is compiled specifically and designed to provide information in a most convenient form. An information source thus is the source from where we get information. It deals with documents and non-documents.

All recorded sources of information irrespective of their contents and form come under documentary sources. These may be published or unpublished, in print or in electronic form. These may be books, periodicals, magazines, or reference books and others.

Documentary sources may be defined loosely as records relating to individuals or groups of individuals that have been generated in the course of their daily lives. This is not to say that documentary sources do not require a structured approach; on the contrary, the use of letters, diaries and the like need a careful methodology in order to extract their relevance for the understanding of society.

The documentary sources of information such as books, periodicals, articles, dictionaries, newspapers, dissertations, guidebooks, directories etc. are organized into quite basic and fundamental categories based on their information content. Depending upon their contents and organizational level, these can be grouped into:

- Primary
- Secondary, and
- Tertiary sources of information

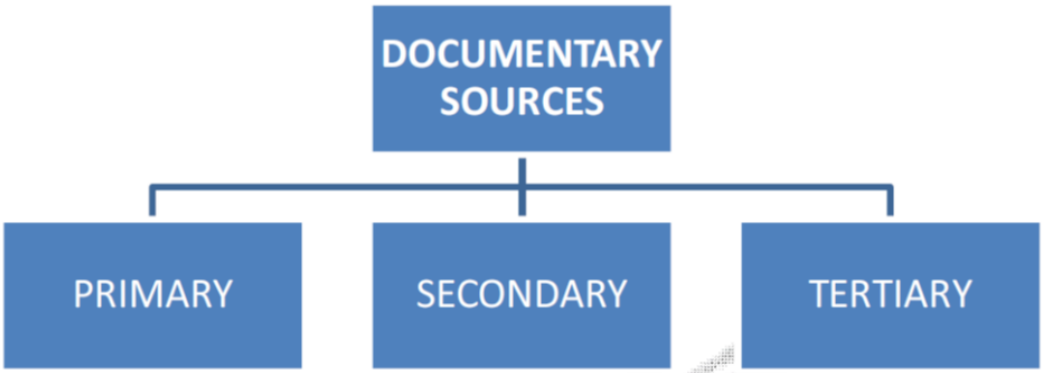


Figure 19: Source (Information Sources: Concept and Need for information Renu Arora ,2017)

The non-documentary sources of information can be defined as those sources and resources of information that are not contained in any document. The non-documentary source comprises of formal and informal sources. Formal sources include information of research organizations, societies, industries, government departments, universities, consultants, etc. Informal sources include human sources, conversation with colleagues, consultants, experts, resource persons, mass media, etc.

The main categories of non-documentary sources are:

- Institutions or Organizations
- Humans
- Mass Media other than print media, and
- Internet

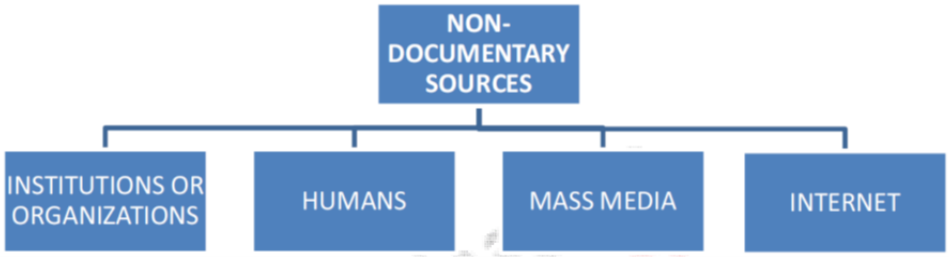


Figure 20: Source: (Information Sources: Concept and Need for information Renu Arora, 2011)

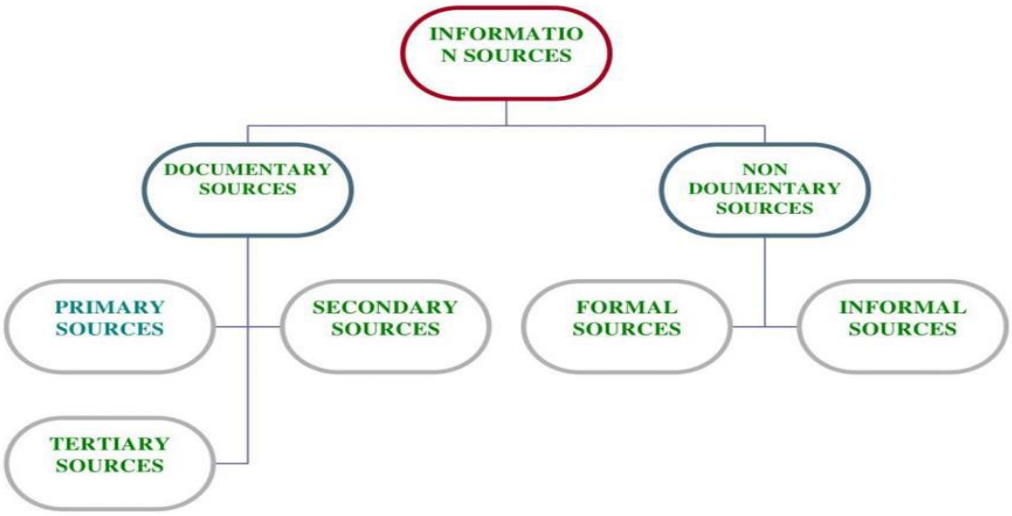


Figure 21.Types of Information Sources. (Source: Anamika Varshney,2011)

3.1.1 Primary Sources

According to the Library of Information Science:

> "Primary sources of information are the first published records of original research and development or description of new application or new interpretation of an old theme or idea. There are original documents representing unfiltered original ideas.
>
> These constitute the latest available information. A researcher producing new information can make it available to the particular community through the primary sources. Often, it may be the only source of information in existence. Primary sources are unorganized sources, which are rather difficult to use by themselves. The secondary sources help us to use these. These are important sources of information. A subject becomes a discipline in its own right when independent primary sources begin to be produced in that area.

Primary source is a term used in a number of disciplines to describe source material that is closest to the person, information, period or idea being studied.

In historiography, a primary source (also called original source) is an artefact, a document, a recording, or other source of information that was created at the time under study. If created by a human source, then a source with direct personal knowledge of the events being described.

It serves as an original source of information about the topic. Similar definitions are used in library Science, and other areas of scholarship".

For Example:

➢ *Books*

➢ *Periodicals*

➢ *Conference Papers*

➢ *Research Monographs*

➢ *Research Reports*

➢ *Patents*

➢ *Standards*

➢ *Thesis*

➢ *Industrial and trade literature*

➢ *Manuscripts*

➢ *Unpublished Sources: -*

> *Memorandum*

> *Laboratory notebooks*

> *Diaries*

> *Company*

> *Files*

> *Portraits*

> *State Papers*

➢ *Web sites*

➢ *Video Recordings*

> *Speeches*

> *Works of Arts, architecture,*

> *Literature and music.*

Source: Types of Information Sources. **(Source: Anamika Varshney,2011)**

For the development of the final graduation project, the primary information sources that will be used will be obtained from sources including Organizational Process assets and Enterprise Environmental factors. These sources will include among other things, consultant's reports, MIPEL Budget plans and personal interviews with the relevant Minister, Permanent Secretary and other stakeholders. Kindly refer to Chart 2 for the specific primary information sources that will be used.

3.1.2 Secondary Sources

The Library of Information Science defines Secondary sources of information as:

> "those which are either compiled from or refer to primary sources of information. The original information having been casually modified selected or reorganized so as to serve a definite purpose for group of users. Such sources contain information arranged and organized on the basis of some definite plan. These contain organized repackaged knowledge rather than new knowledge. Information given in primary sources is made available in a more convenient form. Due to their very nature, secondary sources are

more easily and widely available than primary sources. These not only provide digested information but also serve as bibliographical key to primary sources of information. The primary sources are the first to appear, these are followed by secondary sources. It is difficult to find information from primary sources directly. Therefore, one should consult the secondary sources in the first instance, which will lead one to specific primary sources".

Types of Secondary Sources of Information includes:

1. Index Type:
    (a) Index
    (b) Bibliography
    (c) Indexing periodicals
    (d) Abstracting Periodicals

2. Survey Type:
    (a) Review
    (b) Treatise
    (c)Monograph

3. Reference Type:
    (a) Encyclopaedia
    (b) Dictionary
    (c) Handbook, Manual
    (d) Critical Tables

Source: Types of Information Sources. **(Source: Anamika Varshney,2011)**

For the development of the Final Graduation Project, secondary sources such as PMI publications including the PMBOK Guide Sixth Edition and useful websites will be used.

Please refer to the Chart 2 below for the secondary sources to be used for each specific objective.

Chart 2. Information sources (Source: Albert Jn Baptiste)

Objectives	Information sources	
	Primary	Secondary
Project Integration Management 1.To develop the Integration Management Plan in order to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	1.PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and procedures. 4.Project Governance framework of MIPEL. 5.Historical Information, past project records and documents. 6.Legal and regulatory requirements and constraints. 7.Templates and forms
Project Scope Management 2.To develop the Scope Management Plan in order to ensure that the project is composed of all the work	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and

Objectives	Information sources	
	Primary	Secondary
required,and only the work required to successfully complete the project from the outset and monitored rigorously.	feasibility study and designs report for FAARP-II. 3.Email communication	procedures. 4.Historical Information, past project records and documents. 5.Templates and forms
Project Schedule Management 3.To develop the Schedule Management Plan in order to divide the project into tasks and create both a schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.This Plan also includes how the team will monitor the project schedule and manage changes after the baseline schedule has been approved.	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.Templates and forms 6.Commercial databases (standardized estimating data). 7.Existing formal and informal schedule development, management-control related policies, procedures and guidelines.
Project Cost Management 4.To develop the Cost Management Plan to define the processes for developing and managing the budget	1.Personal Interviews with Permanent Secretary and Minister	1.PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet)

Objectives	Information sources	
	Primary	Secondary
through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that the project is completed within budget.	2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.Cost templates and forms 6.Published commercial information such as resource cost and rate information. 7.Financial control procedures of the Ministry of Finance. 8.Existing formal and informal cost estimating and budgeting-related policies, procedures and guidelines
Project Quality Management 5.To develop a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its performance within the triple	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.Quality templates and forms 6.MIPEL regulations. 7.International Quality Standards. 8.MIPEL quality management systems including policies,

Objectives	Information sources	
	Primary	Secondary
constraints of Time, Cost, and Quality.		procedures and guidelines.
Project Resource Management 6.To develop a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.Cost templates and forms 6.Human resource policies and procedures of MIPEL. 7.Physical resource management policies and procedures of MIPEL. 8.Health and Safety policies of the Labor Department.
Project Communications Management 7.To develop a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's feasibility study and designs report for FAARP-II.	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.Personnel Administration

Objectives	Information sources	
	Primary	Secondary
and effective communication of the project status and other key information.	3.Email communication	policies. 6.MIPEL's policies and procedures for social media, ethics and security. 7.MIPEL's communication requirements. 8.Stakeholder and communications data and information from previous projects.
Project Risk Management 8.To develop a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.Risk statement templates and forms. 6.MIPEL's Risk policy. 7.Authority levels of decision marking.
Project Procurement Management 9.To develop a Procurement Management Plan which describes how	1.Personal Interviews with Permanent Secretary and Minister	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet)

Objectives	Information sources	
	Primary	Secondary
items will be procured during the project and the approach that will be used to manage vendors on the project to deliver results.	2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.MIPEL's Approved seller's list. 6.MIPEL's typical terms and conditions for works, services and results. 7.Procurement and Stores Rules and Regulations of the Government of Saint Lucia. 8.Finance Act. 9.Contract management systems
Project Stakeholder Management 10.To develop a Stakeholder Management Plan to systematically identify, analyze, plan and implement actions designed to address, support, engage and manage all project stakeholders.	1.Personal Interviews with Permanent Secretary and Minister 2.Consultant's feasibility study and designs report for FAARP-II. 3.Email communication	1. PMBOK Guide Sixth Edition (2017), Construction Extension to the PMBOK Guide (2016) and other PMI Resources 2.Websites (Internet) 3.MIPEL standards, policies and procedures. 4.Historical Information, past project records and documents. 5.Stakeholder register templates and forms

3.2 Research Methods

According to the Cambridge Dictionary, research is defined as “a detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding.”

Research method is defined as the tools or an instrument that is used to accomplish the goals and attributes of conducting a research process. Think of the methodology as a systematic process in which the tools or instruments will be employed. There is no use of a tool if it is not being used efficiently.

To understand research methods, we must first understand what research is. Research is a careful study of a specific problem or concern using scientific methods, tools, and instruments.

Research can be about anything, scientific research, basic research, applied research, market research- qualitative market research and quantitative market research, problem-oriented research, problem-solving research. To begin researching something, you need to have a problem or a concern that needs a solution.

In summary, a research method is a particular procedure to establish facts and reach new conclusions.

3.2.1 Analytical Method

In Analytical Research, the researcher has to use facts or information already available, and analyse them to make a determination in terms of how to address a particular problem or make a critical evaluation.

It involves the in-depth study and evaluation of available information in an attempt to provide a road map or a plan to arrive at a plausible solution to a stated problem. Using this research method, facts and information already available will be examined from multiple fronts and used to develop the deliverables as indicated in Chart 3 below.

Chart 3. Research methods (Source Albert Jn Baptiste, the author, 2019)

Objectives	Analytical Research Method
Project Integration Management 1.To develop the Integration Management Plan in order to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 1 will be examined, used and analysed to create the Project Charter for FAARP-II.
Project Scope Management 2.To develop a Scope Management Plan to ensure that the boundaries of the project are well defined from the outset and monitored rigorously.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 2 will be examined, used and analysed to create the Scope Management Plan for FAARP-II.
Project Schedule Management 3.To develop a Schedule Management Plan to divide the project into tasks and create both a schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 3 will be examined, used and analysed to create the Schedule Management Plan for FAARP-II.

Objectives	Analytical Research Method
Project Cost Management 4.To develop a Cost Management Plan to define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that the project is completed within budget.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 4 will be examined, used and analysed to create the Cost Management Plan for FAARP-II.
Project Quality Management 5.To develop a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its performance within the triple constraints of Time, Cost, and Quality.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 5 will be examined, used and analysed to create the Quality Management Plan for FAARP-II.
Project Resource Management 6.To develop a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 6 will be examined, used and analysed to create the Resource Management Plan for FAARP-II.

Objectives	Analytical Research Method
Project Communications Management 7.To develop a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 7 will be examined, used and analysed to create the Communications Management Plan for FAARP-II.
Project Risk Management 8.To develop a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 8 will be examined, used and analysed to create the Risk Management Plan for FAARP-II.
Project Procurement Management 9.To develop a Procurement Management Plan to describe how items will be procured during the project and the approach that will be used to manage vendors on the project to deliver results.	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1 objective 9 will be examined, used and analysed to create the Procurement Management Plan for FAARP-II.
Project Stakeholder Management 10.To develop a Stakeholder Management Plan to systematically identify, analyze, plan and implement	Using the analytical research method, facts and information already available from the sources previously identified in Chart 1

Objectives	Analytical Research Method
actions designed to address, support, engage and manage all project stakeholders	objective 10 will be examined, used and analysed to create the Stakeholder Management Plan for FAARP-II.

3.3 Tools

According to the PMBOK® Guide, a tool is “something tangible, such as a template or software program, used in performing an activity to produce a product or result.” (PMI, p. 725, 2017)

The following tools and techniques groups are used in the Final Graduation project as detailed in the PMBOK® Guide Sixth Edition (2017, page 686):

- Data gathering techniques. Used to collect data and information from a variety of sources.
- Data analysis techniques. Used to organize, assess, and evaluate data and information.
- Data representation techniques. Used to show graphic representations or other methods used to convey data and information.
- Decision-making techniques. Used to select a course of action from different alternatives.
- Communication skills. Used to transfer information between stakeholders.
- Interpersonal and team skills. Used to effectively lead and interact with team members and other stakeholders.

A summary of tools for each objective is shown in the Chart 4 following.

Chart 4. Tools (Source: A. Jn Baptiste, the author, June 2019)

Objectives	Tools
Project Integration Management 1.To develop the Integration Management Plan in order to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.	1. Expert judgment 2. Data gathering 3. Meetings 4.Project Charter Template 5. Project Management Plan template.
Project Scope Management 2.To develop a Scope Management Plan to ensure that the boundaries of the project are well defined from the outset and monitored rigorously.	1. Expert judgement 2. Data gathering 3. Data analysis 4. Decision making 5. Data representation 6.Decomposition 7.Scope management plan template. 8.Work Breakdown Structure Generator
Project Schedule Management 3.To develop a Schedule Management Plan to divide the project into tasks and create both a schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.	1 Expert judgment 2 Data analysis 3 Meetings 4.Decomposition 5. Precedence diagramming method 6. Dependency determination and integration 7. Leads and lags 8.Project management information systems.

Objectives	Tools
	9.Analogous estimating 10.Parametric estimating 11.Three-point estimating 12. Bottom-up estimating 13. Data analysis 14. Decision making 15. Schedule network analysis 16. Critical path method 17.Resource optimization 18.Schedule Management Plan template.
Project Cost Management 4.To develop a Cost Management Plan to define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that the project is completed within budget.	1. Expert judgment 2. Data analysis 3. Meetings 4.. Analogous estimating 5.Parametric estimating 6.Three-point estimating 7. Bottom-up estimating 8. Data analysis 9.Cost Management Plan template. 10.Historical information review 11.Microsoft Excel
Project Quality Management 5.To develop a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and	1. Expert judgement 2. Data gathering 3. Data analysis 4. Decision making 5. Data representation 6.Quality Management Plan

Objectives	Tools
efficient with respect to the purpose of the objectives and its performance within the triple constraints of Time, Cost, and Quality.	template.
Project Resource Management 6.To develop a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.	1.Expert judgement 2.Data representation 3.Organizational theory 4.Resource management template. 5.Responsibility assignment matrix.
Project Communications Management 7.To develop a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.	1 Expert judgment 2 Communication requirements analysis 3 Communication technology 4 Communication models 5 Communication methods 6 Data representation 7.Communications Management Plan template 8.Communications matrix 9.Meetings
Project Risk Management 8.To develop a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.	1.Risk Management Plan template 2.Risk Register template 3. Expert judgment 4. Data gathering 5. Strategies for threats 6. Strategies for opportunities 7.Contingent response strategies

Objectives	Tools
	8.Strategies for overall project risk 9.Data analysis 10.Decision making 11.Risk categorization
Project Procurement Management 9.To develop a Procurement Management Plan to describe how items will be procured during the project and the approach that will be used to manage vendors on the project to deliver results.	1. Expert judgment 2. Data gathering 3. Data analysis 4. Source selection analysis 5. Meetings 6.Procurement management Plan template.
Project Stakeholder Management 10.To develop a Stakeholder Management Plan to systematically identify, analyze, plan and implement actions designed to address, support, engage and manage all project stakeholders	1. Expert judgment 2. Data gathering 3. Data analysis 4. Decision making 5. Data representation 6. Meetings 7.Stakeholder management Plan template 8.Stakeholder analysis chart 9.Stakeholder register template 10.Stakeholder engagement assessment matrix.

3.4 Assumptions and Constraints

The PMBOK® Guide Sixth Edition defines Assumption as “a factor in the planning process that is considered to be true, real, or certain, without proof or demonstration”. (Project Management Institute, A Guide to the Project Management Body of Knowledge (PMI, 2017, p. 698). It also defines constraint as “a limiting factor that affects the execution of a project, program, portfolio, or process”. (PMI, 2017, p.701)

- A summary of assumptions and constraints used in the Final Graduation Project is shown in Chart 5 below.

Chart 5. Tools (Source: A. Jn Baptiste, the author, 2019)

Objectives	Assumptions	Constraints
Project Management Plan 1.To develop a Project Management Plan to determine the project outcome, how a successful outcome will be achieved, who will be involved in the project, and how the project will be measured and communicated.	All contract packages of FAARPII will use the same Project Management Plan.	For the purposes of the graduation project the author will focus on developing a Project Management Plan for Package One of FAARP II as detailed in the project charter. The Project Management Methodology for Package One will be adopted for all the other contract packages.

Objectives	Assumptions	Constraints
Project Integration Management 2.To develop a Integrated Management Plan to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.	Charter will be created before all subsidiary documents.	Limited time to develop. Availability of stakeholders for engagement can be a challenge.
Project Scope Management 3.To develop a Scope Management Plan to ensure that the boundaries of the project are well defined from the outset and monitored rigorously.	All the information required to develop the scope will be readily available from the client-MIPEL.	Limited funding limits the full executable scope. A phased approach to the scope is likely.
Project Schedule Management 4.To develop a Schedule Management Plan to divide the project into tasks and create both a schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.	Sufficient time is allocated to the development of the Schedule Management Plan. Reliable software available to develop the plan.	The time allocated to the execution of the project shall not exceed 36 months.

Objectives	Assumptions	Constraints
Project Cost Management 5.To develop a Cost management Plan to define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that the project is completed within budget.	The budget developed will be a true reflection of the funding required to execute the project.	The budget for the project shall not exceed $59,270,362
Project Quality Management 6.To develop a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its performance within the triple constraints of Time, Cost, and Quality.	The quality management plan will detail all the specifications and standards that will guide the quality management process.	The quality constraints require that the roads be constructed to standards in conformity with that of British or European norms and or American Association of State Highway and Transportation Officials.
Project Resource Management 7.To develop a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.	MIPEL has adequate human capital to successfully undertake the project.	Staff chosen for project assignment must meet certain qualification and experience criteria.

Objectives	Assumptions	Constraints
Project Communications Management 8.To develop a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.	Clear communications protocols will be established to ensure that all stakeholders are adequately addressed in the Communications Management Plan.	Internet access must be reliable to ensure speedy communication by email.
Project Risk Management 9.To develop a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.	Adequate scoping will be done to ensure that all project risks are identified and analysed.	All project risks to be identified in the project planning stage.
Project Procurement Management 10.To develop a Procurement Management Plan to describe how items will be procured during the project and the approach that will be used to manage vendors on the project to deliver results.	A database of reliable service providers and contractors exists.	In the event that funding is sought from a multilateral bank procurement will have to conform to the bank's guidelines.
Project Stakeholder Management 11.To develop a Stakeholder Management Plan to systematically identify, analyze, plan and implement	A comprehensive lists of stakeholders will be developed for	Reliable information required to plan and manage stakeholders.

Objectives	Assumptions	Constraints
actions designed to address, support, engage and manage all project stakeholders	the Stakeholder Management Plan so as to ensure appropriate engagement of all stakeholders at the appropriate levels.	

3.5 Deliverables

Definition

According to the PMBOK® Guide, Sixth Edition “Deliverable is defined as **“**any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project”. (PMI, 2017, p. 704).

Chart 6. Deliverables (Source: A. Jn Baptiste, The Author, 2019)

Objectives	Deliverables
Project Integration Management 1.To develop an Integration Management Plan to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.	**Project Integration Management** 1.A project Charter that will formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.
Project Scope Management	**Project Scope Management**

Objectives	Deliverables
2.To develop a Scope Management Plan to ensure that the boundaries of the project are well defined from the outset and monitored rigorously.	2.A Scope Management Plan that will ensure that the boundaries of the project are well defined from the outset and monitored rigorously.
Project Schedule Management 3.To develop a Schedule Management Plan to divide the project into tasks and create both a schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.	**Project Schedule Management** 3.A Schedule Management Plan that will divide the project into tasks and create both a schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.
Project Cost Management 4.To develop a Cost management Plan to define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that the project is completed within budget.	**Project Cost Management** 4.A Cost management Plan that will define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that the project is completed within budget.
Project Quality Management 5.To develop a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of	**Project Quality Management** 5.AQuality Management Plan that will identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its

Objectives	Deliverables
the objectives and its performance within the triple constraints of Time, Cost, and Quality.	performance within the triple constraints of Time, Cost, and Quality.
Project Resource Management 6.To develop a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.	**Project Resource Management** 6.A Resource Management Plan that will identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.
Project Communications Management 7.To develop a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.	**Project Communications Management** 7.A Communications Management Plan that describe how the information needs of the project and its stakeholders will be planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.
Project Risk Management 8.To develop a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.	**Project Risk Management** 8.A Risk Management Plan which helps foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.
Project Procurement Management 9.To develop a Procurement Management Plan to describe how items will be procured during the project	**Project Procurement Management** 9.A Procurement Management Plan which describes how items will be procured during the project and the

Objectives	Deliverables
and the approach that will be used to manage vendors on the project to deliver results.	approach that will be used to manage vendors on the project to deliver results.
Project Stakeholder Management 10.To develop a Stakeholder Management Plan to systematically identify, analyze, plan and implement actions designed to address, support, engage and manage all project stakeholders	**Project Stakeholder Management** 10.A Stakeholder Management Plan which systematically identifies, analyzes, plans and implements actions designed to address, support, engage and manage all project stakeholders

4. RESULTS

Integration Management Plan

4.1. Project Charter

This section details a Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.

Project Title: Feeder and Agricultural Roads Project Phase II (FARRP-II)
Project Manager: Chief Engineer
Customer: Road Users
Sponsor: Ministry of Infrastructure, Ports, Energy and Labor (MIPE&L)
Duration: 35 months
Project Budget: $45,326,670.05

4.1.1 Background

St. Lucia's agricultural sector, though no longer the driving force of the island's economy, is still an important contributor to the livelihoods of small farmers. However, their earning potential has been adversely affected by the poor riding condition of many of the roads servicing local farms. Reduced quality of export produce such as bananas and locally distributed root crops resulting from bruising, coupled with the higher vehicle operating costs have rendered farming to be an expensive venture, with diminished profitability.

In an effort to reduce hardship on farmers, while also affording the general motoring public greater vehicular comfort and safety when traversing agricultural access roads, the Government of Saint Lucia (GOSL) (the Client) has earmarked 15 (No) feeder and agricultural roads, 37.5km in total length, for rehabilitation under the captioned project. This improvement in quality is meant to be undertaken against the backdrop of sustainability, as the incorporation of timely

maintenance strategies into the implementation framework is expected to guarantee the roads design lives.

In undertaking the Feeder and Agricultural Roads Rehabilitation Project – Phase II, the GOSL seeks to fulfil its mandate in improving the strength and general road riding condition on the targeted roads. The Government of Saint Lucia (GOSL) endeavours to undertake the rehabilitation of 37.50 km of Feeder and Agricultural roads in various parts of the island with a view to significantly improve the quality of those roads. Indicative location of the targeted roads is given below. The major goal is to improve the safety and ride quality of these roads and to keep user costs down.

4.1.2 Statement of the Problem

Poor road conditions pose a challenge to the agricultural sector as it pertains to cost of transportation of inputs by farmers to the farms and the effect of poor road conditions on the quality of produce entering the market.

Literature review has shown that post-harvest crop deterioration is very complex involving a wide range of factors including the age and ripeness of produce, shocks encountered during harvesting, loading and unloading, shocks and vibrations during transport, packaging materials, position in the loading column, cleanliness and the microbiological load, humidity and temperature and storage time. Better farm gate prices (and higher incomes) for produce available for sale, are likely to arise from both lower farm-to-market transport costs, as well as lower crop losses.

An integrated approach to improving farmer income is necessary across the various cross cutting sectors. It is clear that the Ministry of Infrastructure, Ports, Energy and Labour (MIPEL) as the agency mandated to maintain the transport network has a key role to play. In light of this the government with the assistance of the Kuwait Fund for Arab Economic Development (KFAED) has undertaken an

analysis of possible engineering interventions to see how accessibility may be improved, resulting in lower transport and marketing costs and lower crop losses.

The physical state of the transport network, combined with available means of transport, has been analysed in the context of the effect on the crop value chain and engineering interventions developed in respect of some key roads to bring much needed relief to farmers.

4.1.3 Agency Objectives

The project to be implemented is the Government of Saint Lucia's Feeder and Agricultural Road Rehabilitation -Phase II (FAARP II). This involves the rehabilitation of 37.5 km of selected Feeder and Agricultural roads. The development objectives to be achieved through the implementation of the project are:

- Promote and enhance social and economic development throughout the country.
- Improve significantly the general condition of St. Lucia's road network.
- Afford greater comfort to motorists
- Guarantee through timely intervention the design life of roads
- Improve control and disposal of storm water
- Increase the longevity of existing roads
- Safeguard the investment made in road improvement
- Increased farmer interest and investment confidence in the Agricultural Sector
- Increased farmer returns by improving road conditions

The above is expected to be achieved through:

- Improvement of the pavement structure of the existing roads
- A reduction in the incidence of local base failures by taking both curative and preventative measures to improve drainage and verges to combat the destructive effect of water on the infrastructure.

- Prevention of the gradual expansion of deteriorated parts of the road by efficient potholing measures.

Benefits from project implementation are expected to be in the nature of:

- Improved accessibility
- Employment generated during construction
- Improvement in the quality of life of the residents
- Improvement in the ride quality of the roads

FAARP Phase I has been implemented and it is envisioned that FAARP Phases II will be implemented over a 3-year period, during the fiscal years 2020 to 2023.

- The implementation of the FARRP-II forms part of the overall Mission Statement of MIPE&L in its quest for *"Creating an environment that fosters sustainable, social and economic growth of Saint Lucia through the development of a superior road and transportation network."*

- This project, together with the Roads Development Program Phase IV along with the Millennium Highway and West Coast Road Rehabilitation Project seek to address most of the deficiencies in the road network – a key objective of the agency's strategic plan for the improvement of the road network.

- FAARP-II is a continuation of the FARRP-I project which entailed road rehabilitation of numerous Feeder and Agricultural Feeder roads island wide.

The project benefits are as follows:

Economic benefits

i. Increase in the value of land where service routes have been rehabilitated

ii. Increase in the Gross Domestic Product (GDP)
iii. Increase in the value of Government's assets

Social Benefits

i. Decrease in poverty
ii. Creation of employment
iii. Improved service routes to minibus drivers
iv. Reduction in passenger traveling time
v. Environmental Benefits
vi. Less land slippages due to retained/stabilized slopes

4.1.4 Present Status.

The engineering designs for the 37.5 km of road was completed in June 2016 under a Technical Assistance Grant from the KFAED. The GOSL has approached the Caribbean Development Bank (CDB) for a loan to undertake a design and cost review and construction. It is expected that the project will commence in 2020.

4.1.5 Roads to be Addressed.

The roads to be addressed under this initiative are given in Chart 7.

Chart 7. List of Selected Roads (Source: NARCO Engineering Consultants and FDL Consult Inc. Consortium. Consultancy services to conduct a technical-economic feasibility study, detailed engineering designs and Environmental Impact Assessment for the Feeder and Agricultural Roads Project-Phase II (FAARP II), Final feasibility Study Report)

Road Name	Road Number	Name of Starting Point	Name of End Point	Primary Use	Length of Road (km)
Cocoa - En Bamboo - Savanne	C5706	C5707-Vigier Cocoa	B500-Pierrot- Belle Vue	Feeder/ Agriculture	2.354
Grace Woodlands - Vielle Litre	C5306	C5401-Beausejour Grace	C5600-Banse Junction	Agriculture	5.790
Main Traverse - Belmont	C3217	B310-La - Resource - Dernière Rivière	Dead End	Feeder	1.62
Patience Lombard Mont	C4411	A34 – ECR (Patience)	C4412-Highway Lombard	Agricultural	2.816
Bazille Road	C3250	C3252 - Dennery -St. Joseph - Errard Rd	C3204 Morne Panache	Agriculture	4.73
Mardi Gras	C3224	B310-La - Resource - Dernière Rivière	Dead End	Feeder/ Agriculture	1.196
Fond Desir	C5710	B500-Pierrot- Belle Vue	Dead End	Agricultural	0.828
Piat	C1103	B130-Grande Rivière - Monier Road	Dead End	Feeder	1.12
Minea - Pelouge Extension	C4404	C4401-Praslin Pelouge	Dead End	Agricultural	1.7
Morne Bois Den	C5310	C5306 - Grace Woodlands - Vielle Litre	Dead End	Agricultural	2.248
Praslin Pelouge	C4401	A34 ECR(Praslin)	C4403-Praslin Miné	Feeder/ Agricultural	1.760
Vigier Cocoa	C5707	B500-Pierrot- Belle Vue	A36 ECR (Cannelles)	Feeder/ Agriculture	5.70
Viancielle- Mouclay	C5702	C5701- Belle Vue - Viancelle - La Source	Dead End	Agriculture	0.538
Viancelle- La Source	C5703	B500-Pierrot- Belle Vue	Dead End	Agriculture	0.805
Bwa Grand Fond	C5704	C5701-Belle Vue - Viancelle - La Source	Dead End	Agriculture	1.459

4.1.6 Scope of Work and Benefits

The major activities that will be undertaken under FARRP-II are:

- Repairs and construction of drainage structures
- Repairs and construction of retaining structures
- Implementation of slope stabilization mechanisms
- Road rehabilitation including pavement strengthening
- Bridge Construction

Chart 8. Project Benefits (Source: A. Jn. Baptiste, the author, August 2019)

Project Benefits	Measurable Targets	Expected Dates	Who Will Benefit	How the Benefit is Aligned with the Organization Strategy
• Stimulating vital economic activities, including agriculture and tourism by facilitating the accessibility between major communities.	• Project Economic Rate of Return (ERR) to be greater than 12.	2021-2041	• Tour operators • Hotel Sector • Taxi Drivers • Farmers	The Organization seeks to provide quality access to all, especially farmers throughout the country.
• Enable employment opportunities during the construction and maintenance of the road by providing employment for locals within the construction field. Also the food and beverage industry vendors will be benefited. Consultants will also receive employment through the attainment of Contract Management and Supervision contracts.	• Reduction in unemployment along the project route by at least 5% during the life of the project. • Increase in food and beverage sales by vendors along the route by at least 20%.	2021-2023	• Unemployed Youth • Skilled and unskilled workers • Food vendors along the project route • Women	The organization has a mandate to create employment for unemployed youth, especially women by stimulating the construction sector.
• Benefit the quality of life of residents by reducing the travel time frames when transporting between affected communities.	Reduce average travel time by at least 10%	By 2023.	The road user	The organization is charged with the responsibility to reduce travel times on the primary road network by improving the roughness index.
• Increase the property values of the affected communities and increase the possibility of land development.	Fringe property values expected to appreciate by at least 5%.	After 2023	Property owners and land developers	The organization is mandated to encourage economic growth and development through the provision of quality infrastructure.
• Reduce traffic accidents by improving the safety of the road through horizontal road marking, installation of guardrails and replacement of vertical signage. Also by giving strategic maintenance to the road in order to avoid damages in the infrastructure that might cause incidents.	Traffic accidents to decrease by at least 20% over the average of the last 10 years.	After 2023	All road users	In improving safety on transport infrastructure, the organization will be fulfilling government's policy to significantly reduce vehicular accidents and fatalities on the road network.
• The implementation of proper road drainage will decrease the possibility of flooding of the road infrastructure.	Reduce the incidence of flooding in flood prone areas along the project route by 30% over the average for the last 10 years.	After 2023	Residents in flood prone areas.	The organization, in providing quality infrastructure does not only target roads but also drainage.
• Reduction in Vehicle Operating Cost.	Reduction in the average International Road Roughness Index (IRI) from 6 or more to 3 or less.	2021-2023	Vehicle Owners	The organization is mandated to help reduce the foreign exchange deficit by infrastructural interventions which will help reduce the consumption of imported fuel, lubricants, tyres and vehicle parts.

4.1.7 Project Constraints

Schedule Constraints

This construction phase has a 35-month schedule for its full completion which has been divided into three key phases. The project broad implementation plan is detailed below.

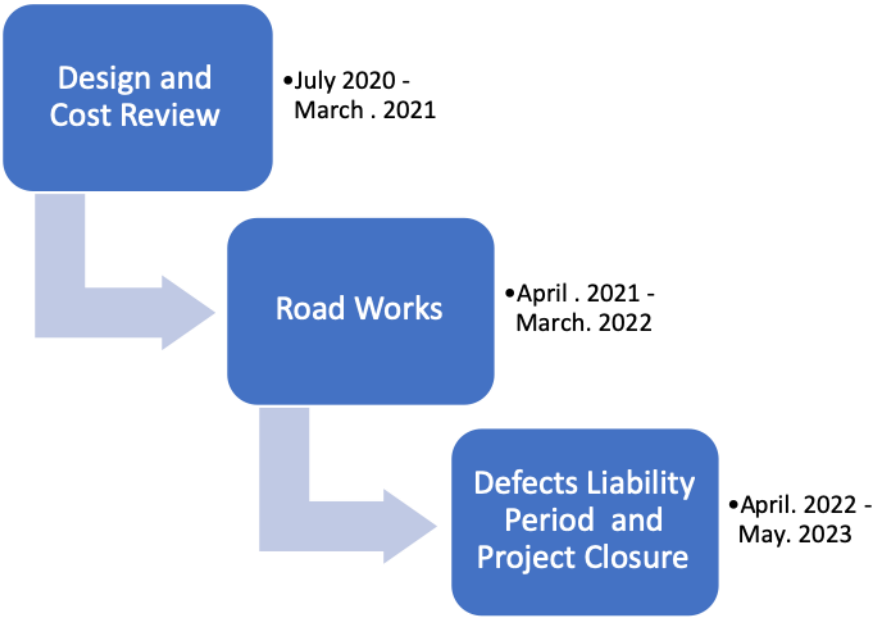


Figure 22. Schedule Constraints (Source: A. Jn. Baptiste, the author, August 2019)

- Procurement for a design and supervisory consultancy to commence no later than July 1, 2020.
- Consultant to be in place by October 06, 2020.
- Designs, cost review and bidding documents to be completed by March,2021.
- Procurement of works contractors to commence by December 1, 2020.
- Road works to commence April, 2021.
- Defects liability period to commence April 1, 2022.
- Project Closure at 31, May 2023.

Quality- Design Constraints

- Geometric and Geotechnical Designs to be in accordance with the UK Transport and Road Research Laboratory (TRRL)-Road Note 6, British Standards, Euro code and AASHTO (American Association of State, Highway and Transportation Officials) standards.
- Hydraulic design of drainage structures and bridges to cater for climate change.
- Designs and Tendering to be completed by April,2021.
- All Right of Way (ROW) issues to be resolved as per existing legislation prior to April 2021.
- Slope Stabilization Design must take into consideration the frequency of slides along routes during the rainy season.

Quality-Technical Constraints

Construction shall be in accordance with:

- British Standard – BS594987:2010
- The UK National Design Standards and Guidelines (Design Manual for roads and bridges)
- Specifications for Highway Works developed by the UK Department of Transport
- AASHTO

Cost/Economic Constraints

- The Project Budget (Cost baseline) stands at **EC$45,326,670.05** with 80% covered by the Caribbean Development Bank and 20% by the Government of Saint Lucia (GOSL).
- The GOSL is required to provide EC$0.5M towards Maintenance on a yearly basis upon project completion.

Legal Constraints

- Employment and labour disputes shall be in accordance with the Labour Laws of Saint Lucia.
- Works shall be undertaken in accordance with the Works and Roads Act of Saint Lucia.
- Procurement shall be in accordance with the Finance Act of Saint Lucia.
- Environmental Management shall be in accordance with Development Control Authority Regulations.

Management Constraints

- All Contractors must have a Health and Safety Pan which conforms to ILO (International Labour Organization) rules.
- All contractors must have a Quality Assurance Plan.
- All works must conform to existing Environmental and Social Policy.
- All workers have the right to be unionized.
- Salaries shall be in accordance with the minimum wage laws.
- Conformance with the United Nations Global Compact

Environmental Constraints

- Execution of the Project to be done in conformity with the Environmental Management plan.
- Climate resilience to be built into all project designs.
- Deconstruction and disposal to be in accordance with existing Waste Management Policy.

Social Constraints

- Construction to be carried out in such a manner so as to minimize inconvenience to road users.
- Work through communities should be minimally disruptive.

- Community Labour to be engaged as much as possible.

Third Parties

- Utility companies to be engaged at all stages to ensure that their concerns are taken into consideration.
- To be engaged prior to any required relocation.

Scope Constraints

- Repairs and construction of road side drainage-For a minimum return period of 5 years.
- Repairs and construction of retaining structures-To be built based on adequate geotechnical investigation
- Implementation of slope stabilization mechanisms in all slide prone areas.
- Road rehabilitation including pavement strengthening –Design life at least 20 years
- Bridge Construction-To be built back better taking into consideration climate resilience
- Establishment of Laybys at Touristic Viewpoints
- Placement of traffic safety devices at all accident hotspots
- Establishment of road markings according to the British Traffic Signs Manual.
- Installation of Vertical road signs according to the British Traffic Signs Manual.
- Repairs to culverts and construction of new ones to ensure sufficient hydraulic capacity in cross drainage structures to ensure climate change resilience.
- Installation of Bus Shelters at all Bus Stops.

4.1.8 Project Assumptions

1. There will be natural disasters to affect the progress of the works.

2. All construction materials will be readily available and on island in time.
3. Contractors have the managerial and technical skills to implement this project.
4. With limited financial capacity, the GOSL lacks the requisite financing to implement the project as sole financier.
5. Increases in prices of fuel and raw materials will lead to project overruns.
6. There will be disturbance to local residents, motoring public and businesses during paved road construction due to the existence of built communities along some of the roads.
7. Volatility in foreign currencies can affect payments to contractors, consultants and suppliers.
8. Severe weather/natural events/disaster – Disastrous events could negatively impact progress implementation.
9. The necessary technical and manpower skills will be available for work.
10. The cost of materials for the project will increase during the project phase, affecting the budget.
11. Physical environment conditions will not change the scope and cost of the project.
12. Project will reduce vehicle-operating costs.

4.1.9 Project Scope:

Services

The Department of Infrastructure, Ports and Energy retains consultants to perform a variety of Engineering and Supervision services. This project will be executed in two phases. Phase I will progress through the design and cost review activities including the complete preparation of the construction plans and associated documents. Phase II will correspond to the construction phase.

The length of service is estimated to be 35 months. This begins with the Notice to Proceed (NTP) and includes all reviews by the team and stakeholders through the award of contract.

A. The Design review firm shall review the designs and cost estimates and prepare construction plans, technical specifications, cost estimates, quantity computations and related construction documents. All work on this project shall be in metric units.
B. The project involves proposed improvements which will include the reconstruction of existing two-lane roads consistent with the selected alternative in the Location/Design Concept Report (L/DCR). The design review will consider construction staging, traffic control, temporary transitions and reuse of existing roadway where possible, drainage features and reconnection of local access.
C. The design shall include and incorporate all mitigation measures identified in the final L/DCR and Environmental Impact Statement (EIS). Work that is of landscape architectural in nature may require professional expertise for the agronomic, architectural components of the projects as needed.
D. The team for the design review effort shall include at a minimum, the Technical Department of DIPE, Department of Physical Planning, Department of Agriculture, Ministry of Tourism, Design and Supervision Consultant and other agencies or interested stakeholders.
E. Provide post design services as necessary for successful construction of the project.
F. The Consultant shall develop a plan for the design review and pre-construction activities necessary for delivering the project in a timely manner consistent with the length of service described. The plan shall include a list of activities, estimated duration and resources as well as a Critical Path Method (CPM) schedule and other information as appropriate. The consultant shall provide a schedule of major project milestones.
G. The Consultant shall provide a CPM schedule compatible to the Primavera scheduling system, MS Project or similar. It shall include the milestones/flags requested by DIPE. An initial schedule shall be submitted within 6 weeks of the Notice to Proceed. The schedule submitted shall be customized to reflect the

specific needs of the project. Work elements for which DIPE has responsibility shall be included in the schedule.

H. The consultant shall include status activities in the schedule in accordance with a schedule furnished by DIPE. Changes to the schedule logic will be submitted to the Project Manager for approval. If the milestones show negative float, the Consultant shall include a narrative of corrective solutions to put the design schedule back on time for delivery.

I. The Consultant shall schedule and attend a regularly scheduled monthly progress meeting. The Consultant shall document the progress meeting through Meeting notes ("minutes"), which shall be distributed to the team within 10 calendar days of the meeting.

J. Design features of this project shall be in accordance with the approved final Environmental Impact Statement (EIS). All mitigation measures identified in the EIS shall be incorporated into the project design. The development of the EIS will be undertaken by the Consultant in accordance with the Terms of Reference Issued by the DIPE.

K. Supervision of Works shall be in accordance with the FIDIC General conditions of Contract for Works Designed by the Client.

Goods (Works)

- The proposed road works for each one of the roads is detailed below in chart 9

Chart 9. Description of Proposed Roadworks (Source Volume 1C: FAARP-II-Environmental and Social Impact Assessment Report & Environmental Management Plan-Narco Engineering Consultants and FDL Inc. Consortium).

#	Road Name	Road Number	Length (Km)	Actual Length (km)	Description of Proposed Works
1	Cocoa - En Bamboo – Savanne	C5706	2.351	2.355	There is rigid pavement on 110m of this road, requiring no treatment. A further 250 m of rigid pavement will be laid. New double surface dressing will be laid on 2.01 km. Earthen drains will be re-shaped along 840 m of road verge. New box drains will be built along 1662 m of road verge. 80 m of box drain will be repaired. Most drainage is located on the left hand side of the road.
2	Grace Woodlands - Vielle Litre	C5306	5.749	5.795	740 m of rigid pavement will be laid. New double surface dressing will be laid on 5.050 km. primarily Earthen drains will be re-shaped along 2960 m of road verge. New curb and slipper drain will be built along 1690 m of road verge. New box drains will be built along 500 m of road verge. 30 m of box drain will be repaired.
3	Main Traverse - Belmont Road	C3217	1.65	1.590	1420m of single surface dressing will be resealed. 200 m of new asphaltic concrete will be laid. Earthen drains will be re-shaped along 530 m of road verge. 1180 m of box drain will be repaired. 30 m of RC swale will be repaired.
4	Patience Lombard Mont	C4411	3.328	2.650	There is rigid pavement on 180m of this road, requiring no treatment. New double surface dressing will be laid on 2650 m. Earthen drains will be re-shaped along 660 m of road verge. New curb and slipper drain will be built along 370 m of road verge, and 20m will be repaired. New box drains will be built along 790 m of road verge. 780 m of box drain will be repaired. 20 m of new RC swale will be built and 10 m repaired.
5	Bazille Road	C3250	5.00	4.730	New double surface dressing will be laid on 4730 m. Earthen drains will be re-shaped along 5600 m of road verge. New box drains will be built along 430 m of road verge. 3 RC swales will be built.
6	Mardi Gras	C3224	1.196	1.190	There is 20 m of asphaltic concrete and rigid pavement on 200 m of this road, requiring no treatment. New double surface dressing will be laid on 980 m. Earthen drains will be re-shaped along 110 m of road verge. New curb and slipper drain will be built along 60 m of road verge, and 20 m repaired. New box drains will be built along 200 m of road verge. 760 m of box drain will be repaired. 40m of RC swale will be built.
7	Fond Desir	C5710	1.1	0.840	170 m of rigid pavement will be laid. New double surface dressing will be laid on 670 m. Earthen drains will be re-shaped along 110 m of road verge. New curb and slipper drain will be built along 650 m of road verge. New box drains will be built along 40 m of road verge. 50 m of box drain will be repaired. 30 m of RC swale will be built.
8	Piat Road	C1103	1.10	1.090	New asphaltic concrete overlay will be placed on 1120 m. New curb and slipper drains will be built along 130 m of road verge, and 80 m repaired. 20 m of RC swale will be repaired, and 10 m built. New box drains will be built along 70 m of road verge. 740 m of box drain will be repaired.

#	Road Name	Road Number	Length (Km)	Actual Length (km)	Description of Proposed Works
9	Minea-Pelouge Extension	C4404	1.94	1.700	New double surface dressing will be laid along 220 m, and rigid pavement along 1040 m. The remainder of the road surface requires no treatment. Earthen drains will be re-shaped along 1060 m of road verge. New box drains will be built along 820 m of road verge.
10	Morne Bois Den	C5310	2.282	2.250	1020 m of concrete strips and 1230 m of rigid pavement will be laid. Earthen drains will be re-shaped along 240 m of road verge. New box drains will be built along 660 m of road verge. 160 m of curb and slipper drain.
11	Praslin-Pelouge C4401	C4401	2.125	1.775	30 m of rigid pavement will be laid. New double surface dressing will be laid on 1730 m. Earthen drains will be re-shaped along 1960 m of road verge. New box drains will be built along 260 m of road verge. 120 m of stone masonry swale will be built.
12	Vigier-Cocoa	C5707	5.729	5.729	2500 of asphaltic concrete overlay will be placed, with new asphaltic concrete along 3230 m. Earthen drains will be re-shaped along 1480 m of road verge. New curb and slipper drain will be built along 710 m of road verge, and 320 m will be repaired. New box drains will be built along 2040 m of road verge. 1580 m of box drain will be repaired.
13	Viancielle - Mouclay	C5702	0.537	0.540	New double surface dressing will be laid on 550 m. New curb and slipper drain will be built along 140 m of road verge. New box drains will be built along 150 m of road verge.
14	Viancelle - La Source	C5703	0.888	0.805	290 m of rigid pavement will be laid. New double surface dressing will be laid on 520 m. Earthen drains will be re-shaped along 530 m of road verge.
15	Bwa Grand Fond	C5704	1.47	1.460	260 m of rigid pavement will be laid. New double surface dressing will be laid on 1200 m. Earthen drains will be re-shaped along 1160 m of road verge. New box drains will be built along 320 m of road verge.

4.1.10 Preliminary Risks

Chart 10. Preliminary Risks (Source: A. Jn. Baptiste, the author, 2019)

Risk description	Risk Category	Probability (1-3)	Impact on Project (1-3)	Risk score(P*I)	Risk priority	Risk response
Delayed approvals related to: • Environmental issues. • Archaeological issues. • Utilities e.g. water, electricity, telecom. • Definition of corridor width requirement. Complementary facilities such as service areas. These might cause delays with commencement of the construction phase.	Design	1	2	2	Low	Risk avoidance: Responsible organizations and Utility companies to be engaged very early in the design process to allow for input of their concerns into the designs. Since it is only the Department of Physical Planning that can compulsorily acquire land the application for the consents required for that acquisition will be carried out through that Department. The level of expropriation is to be determined early in the design exercise.
Detailed Design approvals and consents might be delayed and might cause cost increases or and cancellation of Project.	Design	2	3	6	High	Risk avoidance: Monitor and control the schedule baseline of the project. Risk mitigation: communicating in advance any possible circumstances that might delay the construction phase.
Delay in final approval of detailed construction drawings that could result in increased cost of design or delay of the project.	Design	2	2	4	Average	Risk avoidance: Monitor and control the schedule baseline of the project. Risk mitigation: communicating in advance any possible circumstances that might delay the construction phase
Changes in design and construction standards once the construction has started.	Design	3	2	6	High	Risk avoidance: early identification of likely changes to incorporate them before the start of works. Risk transfer: DIPE must assume the risk if the original design was defective.

Risk description	Risk Category	Probability (1-3)	Impact on Project (1-3)	Risk score(P*I)	Risk priority	Risk response
There may be additional lands that could be necessary for the construction.	Site	2	3	6	High	Risk avoidance: The lands would need to be identified and acquired by the State.
Possible overuse of the roads connected to the project and that might affect the access to it.	Site	1	2	2	Low	Risk avoidance: A detailed environmental management plan will define the responsibility of the contractor with regards to minimizing disruptions along the project route. Necessary traffics signs in roads need to be added.
Protestors or people accessing the project could affect the security measures.	Site	1	2	2	Low	Risk avoidance: Stakeholders management to assure effective communication with the communities. Security around the access points to ensure the access only to people allowed. Risk mitigation: Establish an action plan if the scenario happens.
Latent defects in the existing infrastructure may have impact in constructions costs.	Site	2	1	2	Low	Risk mitigation and transfer: Identify the areas were these defects might occur according to the state of the existing roads. If within time frame of the contract, the contractor should be liable and should repair defects.
Possibility of cost overrun during the construction phase	Construction	3	3	9	High	Risk avoidance: Follow the cost baseline. Risk transfer: The contractor will need to assume the additional costs.
Delays might occur during the construction phase, caused by the State or by the contractor. This may affect the cost and schedule of the projects.	Construction	3	2	6	High	Risk mitigation: In case it is caused by the State, there are mechanisms required to both allow extensions of time to the contractor to complete its construction obligations and grant compensation to the contractor. Risk transfer: In case the delay is caused by the contractor, the DIPE should be able to veto if the delays result in requirements not met.
Labor disputes might occur during the project and might affect performance in different stages.	Construction	2	1	2	Low	Risk avoidance: Have the necessary labor contracts. Risk mitigation: Assigning targets to laborers and providing incentives to motivate them.
There could be delays because of defective materials.	Construction	1	1	1	Low	Risk transfer: Having insurance on the materials.

Risk description	Risk Category	Probability (1-3)	Impact on Project (1-3)	Risk score(P*I)	Risk priority	Risk response
Natural disasters may occur during the construction phase and cause delays and or loss of resources.	Construction	3	2* Depends on the impact.	6	High	Risk transfer: Having insurance for this kind of scenarios so compensation of material damages can be applied.
Volatility in foreign currencies can affect payments to contractors, consultants and suppliers.	Different phases of life cycle.	2	1	2	Low	Risk mitigation: Contract will include clause for fixed currency conversion during contract period.

4.1.11 Preliminary Stakeholder List

Chart 11. Preliminary Stakeholder list (source: A. Jn. Baptiste, the author, 2019)

Stakeholder Name	Position	Contact Information	Preferred Communication Method	Location	Role
The person's name or the name of the point of contact representing an entity. If no name is available, then list the group or organization.	This is the stakeholder's position within their company or organization (Director of Marketing, Chief, Human Resources, etc.)	This includes the 2 or 3 primary means of contact (e.g., email and telephone number)	Email? Text message? Phone? Face-to-Face. It is sometimes best to have a primary and an alternate.	This is the physical location of the stakeholder - helpful for virtual teams and establishing the mode(s) for project communications	This is the stakeholder's role in the project (e.g., Sponsor, PM, Functional Manager, Client Manager, Customer Representative to Product Design, etc.)
(DIPE)	Chief Engineer	• email • cell number	Face to Face/Email/ Text	Ministry of Infrastructure Building, Union	• Serve public interest based on the organization's and government strategy • Resolve right-of-way issues • Approves certain changes, payments and any proposal from consultant • ensure the project completed successfully in terms of quality, time and cost
Consultant	Chief Resident Engineer	• email • cell number	Face to Face/Email/ Text	To be determined.	• Communicate identified variations with the DIPE, provides the consultancy advice for the project on designing, evaluating the cost, technical issues/advice • Administers contracts and supervises the work • Develops the design of the project; produces drawings and specification; ensures that a project is implemented within cost and time, and according to quality and agreement • Reports project progress to the DIPE in a timely manner • Approves work proposals from contractor • Prepare payment certificates for executed work • Communicate with local Authorities and community delegates to

Stakeholder Name	Position	Contact Information	Preferred Communication Method	Location	Role
					resolve issues and create good work environment
Main Contractor	Construction Manager	• email • cell number	Face to Face/Email	To be determined.	• Brings the design of project to reality • Carries out and completes the work designed by consultants to meet time, cost and quality objectives; supervises and manages operations on site; sometimes assists in design; coordinates and supervises all sub-contract work, materials and suppliers.
Sub-Contractor	Construction Manager	• email • cell number	Face to Face/Email	To be determined.	•Carries out and completes the work ordered by main contractor
CDB(Financier)	Projects Officer	• email • cell number	Email/Phone	Caribbean Development Bank, Barbados	• Provides the necessary funds to the project; Ensures that the funds are utilized for the purpose; check if funds are used for this particular activity • Approves request for additional budget from client/ERA
Town and Village Councils	Town Clerk	• email • cell number	Face to Face/Email	Constituency Councils	• Make work environment favourable by discussing with community • Resolve Right-of-way (ROW) issue collaborating with ERA ROW experts • Discus with community about the project and transfer community questions for client or consultant
National Trust/Physical Planning	Director of the Trust/Chief Physical Planner	• email • cell number	Email/Phone	Pigeon National Park, Gros Islet/ New Government Buildings, Waterfront, Castries	• Make sure the project doesn't pollute the environment • Recommend best mechanisms to protect the environment while construction activity is carried out
NGO	Director of AIDS Foundation/St Lucia Archaeological and Historical Society/Others	• email • cell number	Email/Phone	Ministry of Health, Waterfront, Castries/Pigeon Island National Land Mark, Gros Islet	• Creates awareness on HIV/AIDS protection mechanisms for workers • Discuss with environmentalists and consultants to protect community interest and environment

Stakeholder Name	Position	Contact Information	Preferred Communication Method	Location	Role
Media	Various	• email • cell number	Email/Phone	Various	• Transmit information about the projects to the community
Ministry of Agriculture	Director of Agricultural Services	• email • cell number	Email/Phone	New Government Buildings, Waterfront	• Recommending on Agricultural products and Forest issues
National Minibus Association	President	• email • cell number	Face to Face/Email		•Ensures that the interest of the Bus Transport Sector are attended to.
National Taxi Association	President	• email • cell number	Face to Face/Email	Pointe Seraphine, Castries	•Ensures that the concerns of the Taxis Tour Operators are addressed.
Ministry of Finance	Director of Finance	• email • cell number	Email/Phone	Financial Administrative Center, Waterfront	• Make sure that Tourist based amenities are included in the designs and are constructed. • Ensures that Tourism Interest on the West Coast Road are not disadvantaged during Construction.
Ministry of Tourism	PS Tourism	• email • cell number	Email/Phone	New Government Buildings, Waterfront, Castries	• Approves budget changes based on annual budget
Ministry of Economic Development	Chief Economist	• email • cell number	Email/Phone	Financial Administrative Centre, Waterfront	• Conduct a payment based on request of consultant and DIPE • Acts as liaison entity between Donor/Funding Agency and the DIPE
Lucelec, WASCO, Digicel and FLOW	Managers	• email • cell number	Email/Phone	Various	• Remove obstruction related to their organizations after compensation have been paid
District Rep.	Elected Members of Parliament.	• email • cell number	Face to Face/Phone	Various	• Make sure the project is going based on the regulation, objective, and protecting the interest of community

4.1.12 Milestone List-FARRPII-Package 1

Chart 12. Key Milestones (Source: A. Jn. Baptiste, the author, August 2019)

Milestone	Description	Date
1	Commencement of procurement process for Design Review and Supervision consultant	01/07/2020
2	Award of consultancy contract	06/10/20
3	Completion of design review services	01/12/20
4	Commencement of procurement process for Works Contractor	01/12/20
5	Award of works contract	09/03/21
6	Issuance of Taking Over certificate	26/05/21
7	Issuance of Performance Certificate	25/05/22
8	Project Closure	22/06/22

4.1.13 Business Case

The earning potential of local farmers has been adversely affected by the poor riding condition of many of the roads servicing their farms and the attendant reduction in the quality of export produce as well as higher vehicle operating costs. The GOSL, having recognized the hardship on farmers, has sought to bring reprieve through the implementation of a road improvement scheme targeted at feeder and agricultural roads. To this end, 15 (No) feeder and agricultural roads, 37.5km in total length were preselected by the Client and earmarked for rehabilitation under the FAARP-II.

The preselected roads were ranked in order of priority, by assessing the tangible and intangible cost and benefits associated with implementing the project vis-à- vis non implementation.

The economic feasibility of rehabilitation works to each road was evaluated by determining the individual Internal Rate of Return (IRR) for each alternative investment as a measure of overall project efficiency and worth. This indicator was preferentially selected over NPV, as IRR is historically and logically linked to the financial concepts of return on investment and interest on a loan.

The IRR scores for all of the preselected roads yielded values above the 12.0% discount rate agreed for the project, meaning that rehabilitation works on all of the roads is economically justifiable. However, the United Nations 2005, World Summit defined the interdependent and mutually reinforcing pillars of sustainable development as economic development, social development and environmental protection· Accordingly, the selection of projects based only on highest economic return overlooks this interdependency. Therefore, IRR as an indicator of economic feasibility was not used as a stand-alone tool for determining road priority, but was instead used to determine the 'optimum' engineering solution in terms of alignment, width and pavement design for each road.

The results of the economic analysis of the selected alternatives are presented in Chart 13 The IRR for the various alternatives varies from 50 to 13, which, based on the selected indicator all roads are economically viable for the selected surface alternative. The preliminary total cost of the road improvement is EC **$45,326,670.05**.

Chart 13.Economic Analysis Results (Source: NARCO Engineering Consultants and FDL Consult Inc. Consortium,2016)

Road Name	Road Number	Surface Type	Cost	IRR
Cocoa - En Bamboo -	C5706	DSD	2.29	22
Grace Woodlands - Vielle Litre	C5306	DSD	5.95	16
Main Traverse - Belmont	C3217	DSD	1.43	17
Patience Lombard Mont	C4411	DSD	2.92	29
Bazille Road	C3250	DSD	4.11	14
Mardi Gras	C3224	DSD	1.34	29
Fond Desir	C5710	DSD	0.75	15
Piat	C1103	AC	1.52	30
Minea - Pelouge Extension	C4404	Concrete/ Concrete Strips	1.58	17
Morne Bois Den	C5310	Full Width Concrete/Strips	2.06	20
Praslin Pelouge	C4401	DSD	1.91	20
Vigier Cocoa	C5707	AC	6.87	50
Viancielle- Mouclay	C5702	DSD	0.55	13
Viancelle- La Source	C5703	Concrete/ Concrete	0.88	13
Bwa Grand Fond	C5704	Concrete/ Concrete	1.33	15

A multi-criteria method of analysis was selected to ensure that the priority ranking of the preselected roads was context sensitive to ensure a balance of economic, social and environmental objectives. This method hinged on constraining non-monetary benefits to road rehabilitation, by vetting the feasibility of rehabilitating each road against criteria such as population served, access to social services, impact on agriculture, connectivity and environmental impact. The final road priority ranking however was not developed in isolation of economic feasibility, as the IRR for each road corresponding to the most desirable engineering intervention derived from the economic analysis, was

also incorporated into the vetting criteria. These criteria were weighted, based on best practice and the Client's objective, as shown below:

Chart 14. Multi-Criteria Weighting (Source: NARCO Engineering Consultants and FDL Consult Inc. Consortium ,2016)

Criteria and Sub-Criteria	Weighting (%)
Economic	
Economic Efficiency	35
Subtotal	***35***
Social	
Population Served (per km)	10
Access to other Social Services (Health, Administrative and Markets)	10
Influence on Agriculture	20
Connectivity	5
Subtotal	***45***
Environmental	
Impacts on the Natural Environment	20
Subtotal	***20***
Grand Total	**100**

Given that the roads were already preselected by the Client, the priority ranking arising from the multi-criteria analyses (as shown below), lists the roads in order of decreasing overall benefits to the end users, as all of the roads possess agricultural, social and environmental importance to their communities that economic viability alone is unable to measure.

Chart 15. Priority Ranking of the Roads (Source: NARCO Engineering Consultants and FDL Consult Inc. Consortium,2016)

Road Number	Multi-Criteria Analysis Score	Priority Ranking	Road Name
C5707	0.9492	1	Vigier-Cocoa
C1103	0.9134	2	Piat
C4411	0.9125	3	Patience Lombard Mont
C5306	0.9110	4	Grace Woodlands - Vielle Litre
C4401	0.9056	5	Praslin Pelouge
C3224	0.9032	6	Mardi Gras
C3217	0.8966	7	Main Traverse - Belmont
C5710	0.8959	8	Fond Desir
C5706	0.8545	9	Cocoa - En Bamboo - Savanne
C5310	0.8516	10	Morne Bois Den
C4404	0.8372	11	Pelouge Extension
C3250	0.8274	12	Bazille Road
C5704	0.8274	13	Bwa Grand Fond
C5703	0.8228	14	Viancelle- La Source
C5702	0.8188	15	Viancielle- Mouclay

The IRR scores for all of the preselected roads yielded values above the 12.0% discount rate agreed for the project; meaning that the monetary benefits associated with rehabilitation works on all of the roads exceed the attendant costs of non-implementation. Whereas economic feasibility alone was deemed to be insufficient to fully capture the inherent intangible benefits that rehabilitating the project's roads would afford commuters, each of the proposed improvement schemes was shown to be economically viable.

4.1.14 Implementing Agency.

The implementing agency shall be the Ministry of Infrastructure, Ports, Energy and Labour (MIPEL). The MIPEL is headed by a Minister as determined by the Constitution. The Technical Services Department of the MIPST is headed by a Chief Engineer whose authority is enshrined in the Works and Road Act (2001).

4.1.15 Agency Construction Oversight and Technical Supervision.

It is expected that the project will be jointly funded by GOSL and CDB through a loan agreement. Project oversight for compliance with the Loan Agreement will be provided by the Department of Economic Development of the Ministry of Finance (St. Lucia), which will also be the liaison between the Caribbean Development Bank (CDB) and the implementation agency.

MIPEL, with the help of a proficient engineering consultant is capable of effectively undertaking the technical supervision of the project. The selection and evaluation criteria will be subject to the approval of CDB. Further the MIPEL and the local engineering sector have extensive experience in implementing major capital projects with greater scope and complexity than this project. More significantly the Feeder and Agricultural Roads Rehabilitation Project Phase I was successfully executed in its entirety by local contractors and supervised primarily by local consultants. FAARP Phase I was co-funded by the Government of Saint Lucia and Kuwait Fund for Arab Economic Development (KFAED).

The project will be managed through the MIPEL's Project Management Unit (SPU). This is consistent with the Ministry's approach to managing capital funds from multilateral lending sources.

4.1.16 Post Construction Project Requirements.

The MIPEL also has the institutional capacity to maintain the project roads through its existing structure. All maintenance is presently done through private contractors with some minimal amount of routine maintenance done by an in-house MIPEL Road Maintenance Unit. There is also excess capacity in the private sector to maintain the project.

4.1.17 Procurement and Packaging

Construction estimates are based on fair assumptions of market conditions, overheads and profits. Actual market conditions and overarching business imperatives may differ from estimates. Therefore, inviting bids through a competitive process may result in achieving a successful project well below original estimates. It is proposed that the project be procured as six packages as indicated in chart 16.

Chart 16. Proposed Procurement Lots/Packages (Source: NARCO Engineering Consultants and FDL Consult Inc. Consortium,2016)

Package	Road Names
1	Piat
2	Mardi Gras + Main Traverse Belmont + Bazille
3	Praslin Pelouge + Minea-Pelouge Extension + Patience Lombard
4	La Source + Bwa Grand Fond + Mouclay
5	Vigier Cacoa + Cacoa En Bamboo Savanne + Fond Desir
6	Grace Woodlands + Morne Bois Den

Based on the tendered prices a negotiation process in accordance with the procurement rules of the CDB and the Government of St. Lucia may have to be initiated to reduce the scope, consistent with the options.

4.1.18 Budget

Chart 17. Preliminary Budget (Source: A. Jn. Baptiste, The Author, 2019)

Project Element	Cost	% of Construction Cost
Design and Cost Review	$532,545.47	1.5% of construction cost
Contingency reserve-10%	$52,254.55	
12.5% VAT on Design and Cost Review	$73,225.00	
Supervision Consultancy	$2,485,212.18	7.0% of construction cost
Contingency reserve-10%	$248,521.22	
12.5% VAT on Supervision Consultancy	$341,716.67	
Works	$35,503,031.18	
Contingency reserve-10%	$355,030.31	
12.5% VAT on Works	$4,881666.79	
Project Management	$532,545.47	1.5% of construction cost
Contingency reserve-10%	$53,254.55	
Land acquisition	$150,000.00	
Contingency reserve-10%	$15,000.00	
Crop compensation	$93,333.33	
Contingency reserve-10%	$9,333.33	
Base Cost	**$45,326,670.05**	

4.2. Scope Management Plan

4.2.1 Introduction

The term “project scope” refers to the sum of all products, services and results that will be provided by the project.

The purpose of this scope management plan is to set forth the plans and procedures for defining, developing, monitoring, controlling, changing, implementing and verifying the project scope. It’s the intent of scope management to ensure the completion of all the work required, and only the work required, to complete the project successfully.

For the purposes of the Feeder and agricultural Roads Project the Project Scope Management Plan follows a six step process as detailed in “A Guide to the Project Management Body of Knowledge (PMBOK) Sixth Edition published by the Project Management Institute (PMI): Plan Scope Management, Collect Requirements, Define Scope, Create WBS, Verify Scope and Control Scope.

The Scope Management Plan provides the scope framework for Package 1 of FAARP-II. This plan documents the scope management approach, roles and responsibilities as they pertain to project scope, scope definition, verification and control measures, scope change control, and the project’s work breakdown structure. Any project communication which pertains to the project’s scope should adhere to the Scope Management Plan.

The objective of Package 1 of FAARP-II is the rehabilitation of the Piat Road. This includes drainage works, road structural strengthening, culvert reconstruction and grillage works. Works for this project will be outsourced.

4.2.2 Scope Management Approach

This section provides a summary of the Scope Management Plan and addresses the following:

- Authorities and responsibilities for scope management
- Scope definition process (i.e. Scope Statement, WBS, WBS Dictionary, Statement of Work, etc.)
- Scope measurement and verification (i.e. Quality Checklists, Scope Baseline, Work Performance Measurements, etc.)
- Scope change process (who initiates, who authorizes, etc.)
- Acceptance and approval of project deliverables related to project scope

For Package 1 of FAARP-II, scope management will be the responsibility of the Project Director who is the Chief Engineer. The scope for this project is defined by the Scope Statement, Work Breakdown Structure (WBS) and WBS Dictionary. The Project Director, Sponsor and Stakeholders will establish and approve documentation for measuring project scope which includes deliverable quality checklists and work performance measurements. Proposed scope changes may be initiated by the Project Director, Stakeholders or any member of the project team. All change requests will be submitted to provide estimate and impact to schedule and costs if any to the Project Director who will then evaluate the requested scope change. Upon acceptance of the scope change request the Project Director will submit the scope change request to the Change Control Board (Project Steering Committee) and Project Sponsor for acceptance. Upon approval of scope changes by the Change Control Board and Project Sponsor the Project Director will update all project documents and communicate the scope change to all stakeholders. Based on feedback and input from the Project Director and Stakeholders, the Project Sponsor is responsible for the acceptance of the final project deliverables and project scope.

4.2.3 Roles and Responsibilities

In order to successfully manage the project's scope, it is important to clearly define all roles and responsibilities for scope management. In this section we define the role of the Project Director, Project Team, Stakeholders and other key persons who are involved in managing the scope of the project. Here we state who is

responsible for scope management and who is responsible for accepting the deliverables of the project as defined by the project's scope. Any other roles in scope management will be detailed via this template.

The Project Director, Sponsor and project team will all play key roles in managing the scope of this project. As such, the Project Sponsor, Project Manager, and team members must be aware of their responsibilities in order to ensure that work performed on the project is within the established scope throughout the entire duration of the project. The Chart 18 below defines the roles and responsibilities for the scope management of Package 1 of FAARP-II.

Chart 18. Roles and Responsibilities (Source: A. Jn. Baptiste, The Author, 2019)

Role	Description
Project Sponsor (DIPE)	Provides executive team approval and sponsorship for the project. Has budget ownership for the project and is the major stakeholder and recipient for the project deliverables.
Project Director/Project Manager (Chief Engineer)	Provides overall management to the project. Accountable for establishing a Project Charter, developing and managing the work plan, securing appropriate resources and delegating the work and insuring successful completion of the project. All project team members report to the project manager. Handles all project administrative duties, interfaces to project sponsors and owners and has overall accountability for the project.
Steering Committee (Change Control Board) (To be appointed	Provide assistance in resolving issues that arise beyond the project manager's jurisdiction. Monitor project progress and provide necessary tools and support when milestones are in jeopardy. Evaluate and approve scope change request.

Role	Description
by the DIPE)	
Stakeholder (Various)	Key provider of requirements and recipient of project deliverable and associated benefits. Deliverable will directly enhance the stakeholder's wellbeing. Majority of stakeholders for this project will be from other government Ministries, Non-Governmental Organizations (NGO), District Representative and project management representatives.
Team Member (Includes consultants)	Working project team member who analyzes, designs and supervises the work. This includes collaborating with teams to develop designs and identify best practices for work processes, partnering with team members to identify appropriate opportunities, challenging the old rules of construction and stimulating creating thinking, and ensuring sustainable development practices.

4.2.4 Define scope

This can only be completed after the requirements have been identified and defined during the requirements definition process.

During the requirements definition process, the Requirements Management Plan and the Requirements Traceability Matrix were created. In defining the project scope, these documents were used as reference.

This section explains the process followed to develop the detailed description of the project and its deliverables. In defining the scope, the Project Charter, Preliminary Project Scope Statement or Requirements Documentation were used. The scope definition process is tied back to the requirements definition as the project's scope answers the requirements for the project.

The tools and techniques used to define the project scope were expert judgment, product analysis and alternatives identification.

The scope for Package 1 of FAARP-II was defined through a comprehensive requirements collection process. First, a thorough analysis was performed through a consultancy on the agency's infrastructural pressures as it pertains to the transportation needs of farmers. From the results of this consultancy the project team developed the project requirements documentation, the requirements management plan, and the requirements traceability matrix for what the new road project must accomplish.

The project description and deliverables were developed based on the requirements collection process and input from subject matter experts in road design, technical support, and project management methodologies. This process of expert judgment provided feedback on the most effective ways to meet the original requirements of providing an informed strategy for addressing the farmers needs in terms of quality road infrastructure for the transport of inputs and produce.

4.2.5 Project Scope Statement

The project scope statement details the project's deliverables and the work necessary to create these deliverables. The Project Scope Statement contains the following components:

- Product Scope Description (In Scope) – Describes what the project will accomplish.
- Product Completion/Acceptance Criteria – Describes what requirements must be met in order for the project to be accepted as complete
- Risk Assessment- Describe the key projects risk and a high-level mitigation plan. This brief assessment will be expanded in the formal Risk Management Plan.
- Project Deliverables – Detailed list of deliverables the project will result in.
- Project Exclusions (Out of Scope) – Description of work that is not included in the project and outside of the scope.

- Project Constraints – Lists limits on resources for time, money, manpower, or equipment (capital).
- Measures of Project Success- This section describes the metrics that will be used on the project to determine how success will be measured.
- Project Assumptions – Describes the list of assumptions the project team and stakeholders are working under to complete the project.

The Package 1 of FAARP-II scope statement provides a detailed description of the project, deliverables, constraints, exclusions, assumptions, and acceptance criteria. Additionally, the scope statement includes what work should not be performed in order to eliminate any implied but unnecessary work which falls outside the of the project's scope.

Package 1 of FAARP-II forms part of FAARP II which involves the design review and rehabilitation of 37.50 km of Feeder and Agricultural roads across the island of Saint Lucia. Specifically Package 1 involves the rehabilitation of 1.1 km of road to British (BS) and ASHTO standards (American Association of State, Highway and Transport Officials). The deliverables for this project are a fully rehabilitated road replete with an asphalt concrete surface, adequate drainage structures designed to handle a 1 in 5-year rainfall event, culvert structures designed to handle a 1 in 25-year storm event, bridge structures designed to handle a 1 in 50-year storm event, road and traffic safety furniture to international standards. This project will be accepted once the road complies with all specification detailed in the contract document for the works. Material testing will be undertaken as detailed in the contract specifications to ensure that quality requirements are met. This project does not include ongoing operations and maintenance of the road. External contractors will be used to undertake the required works. Additionally, the project is not to exceed 516 days in duration or $2,640,069.11 (Includes 12.5% VAT) in cost. Assumptions for this project are that support will be provided by the project sponsor and all department managers and that adequate internal resources are available for the successful completion of this project.

Road Name: Piat Road-1.120 km

Chart 19. Scope of Works (Source: NARCO Engineering Consultants and FDL Consult Inc. Consortium,2016)

Road Pavement Schedule

Section	Chainage		Length (m)	Proposed width (m)	Shoulder width (m)	Cross fall (%)	Status	Proposed Surface Type
	From	To						
1	0+000	0+850	850	5.0	Varies	2.0%	New	Overlay w/ Asphaltic Concrete
2	0+850	1+030	180	5.0	Varies		New	Overlay w/ Asphaltic Concrete
3	1+030	1+120	90	5.0	Varies	2.0%	New	Overlay w/ Asphaltic Concrete

Culvert Schedule

Section	Chainage	Length (m)	Type of Structure	Dimension (mm)	Condition	Proposed Intervention
1	0+070	4.75	Crossing	5.4 x 1.55m	•Wing walls are damaged	
1	0+225	6.95	Circular	600	Headwalls are in good condition	•Clear outfall •River training using gabion basket wall, rip rap and gabion mattress
1	0+300				Grill crossing (0.60 m wide x 8.7 m long) across access road leading to Fostin Development	Cleaning/clearing of vegetation and silt; general maintenance
1	0+315	9.82	Circular	600	•Downstream headwall is damaged •Upstream headwall is in good condition	•Repair downstream headwall •New outlet drain •Clear Vegetation
1	0+425	9.1	Crossing	1.52 x 1.55m	•Base of crossing is scoured upstream	•Reconstruction of base with scour protection at upstream; repair wing wall at upstream

Section	Chainage	Length (m)	Type of Structure	Dimension (mm)	Condition	Proposed Intervention
						•Extend retaining wing wall at downstream (right side) •Scour protection (rip-rap) at outfall with river training works (gabion baskets);
1	0+510	5.9	Circular	450	Headwalls are in good condition	•Clear vegetation •New line drains into catch pit •Cascade outlet drain (RC)

1	0+575	5.95	Circular	450	•Downstream headwall is leaning •Failed section of road in front of downstream headwall	•Reconstruction of culvert- 900mm dia. with headwalls and outlet drain
1	0+625	5.3	Circular	600	Downstream headwall in good condition	•New headwall upstream • Clear out vegetation and silt in catch pits and drains
1	0+700	3.6	Circular	600		•New headwall upstream • Clear out vegetation and silt in catch pits and drains
1	0+740	7.8	Circular	900	Damaged base at both upstream and downstream; culvert in fair to good condition	•Repair outlet opening •Clear out vegetation and silt •Scour protection •Repair base of culvert at upstream and downstream- stone pitch base
2	0+915	5.1	Grill	500	Excessive vegetation growth and silting under grill	Clean/clear out vegetation and silt
2	1+020	6.1	Grill	600	One rib of grill bent and disfigured (3m long of damage)	•Repair/ replace grill
3	1+030	5.5	Grill	600	Good condition- Clear of silt and vegetation	Ditto

Roadside Drainage Schedule

Section	Chainage			Drain Type	Comment
	From	To			
1	0+030	0+040	10	Box drain (r.c)	Clean and repair
1	0+050	0+060	10	Box drain (r.c)	Clean and repair
1	0+070	0+220	150	Box drain (r.c)	Clean and repair
1	0+230	0+310	80	Box drain (r.c)	Clean and repair
1	0+340	0+370	30	Curb and slipper	Clean and repair
1	0+390	0+410	20	Curb and slipper	Clean and repair
1	0+410	0+430	20	Box drain (r.c)	Clean and repair
1	0+440	0+740	300	Box drain (r.c)	Clean and repair
1	0+760	0+800	40	Curb and slipper	Clean and repair
1	0+800	0+850	50	Curb and slipper	New

Section	Chainage		Length(m)	Drain Type	Comments
	From	To			
1	0+000	0+040	40	Box drain (r.c)	Clean and repair
1	0+070	0+150	80	Box drain (r.c)	Clean and repair
1	0+740	0+850	110	Curb and slipper	New
1	0+850	0+870	20	Curb and slipper	Clean and repair
2	0+900	1+030	130	Box drain (r.c)	Clean and repair
3	1+030	1+120	90	Box drain (blockwork)	New

4.2.6 Project Assumptions

1. There will be natural disasters to affect the progress of the works.
2. All construction materials will be readily available and on island in time.
3. Contractors have the managerial and technical skills to implement this project.
4. With limited financial capacity, the GOSL lacks the requisite financing to implement the project as sole financier.
5. Increases in prices of fuel and raw materials will lead to project overruns.
6. There will be disturbance to local residents, motoring public and businesses during paved road construction due to the existence of built communities along some of the roads.
7. Volatility in foreign currencies can affect payments to contractors, consultants and suppliers.
8. Severe weather/natural events/disaster – Disastrous events could negatively impact progress implementation.
9. Technical and manpower skills will be available for work.
10. The cost of materials for the project will increase during the project phase, affecting the budget.
11. Physical environment conditions will not change the scope and cost of the project.
12. Project will reduce vehicle operating costs.
13. Sufficient skilled workers are available to do the works.
14. Package 1 will be completed within budget.
15. Package 1 will be completed within 3 months.

4.2.7 Work Breakdown Structure

The Work Breakdown Structure (WBS) and Work Breakdown Structure Dictionary are key elements to effective scope management. This section details how the project scope is subdivided into smaller deliverables in the WBS and WBS

Dictionary and how these smaller components are managed during the life of the project.

For more effective management, the work required to complete Package 1 of FAARP-II will be subdivided into individual work packages. This will allow the Project Director to more effectively manage the project's scope as the project team works on the tasks necessary for project completion. The project is broken down into four phases: the pre-construction phase (Initiation), the construction phase (Execution), the project management and supervision phase (Monitoring and Evaluation) and the project closure phase (Closure). Each of these phases is then subdivided further down to work packages.

Work Breakdown Structure Levels

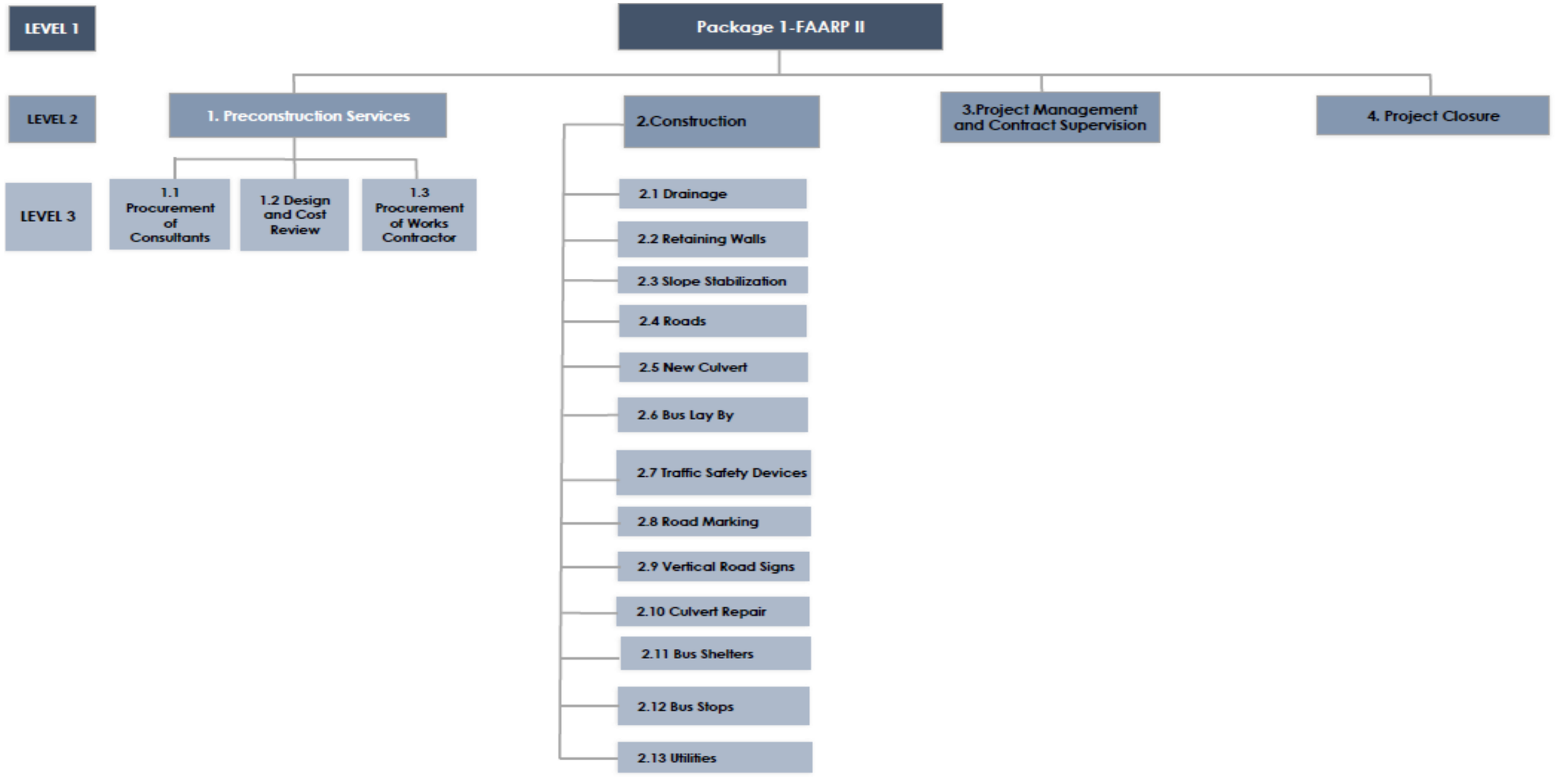


Figure 23: Work Breakdown Structure Levels (Source: A. Jn. Baptiste, the Author)

4.2.8 WBS Dictionary

The WBS Dictionary contains all the details of the WBS which are necessary to successfully complete the project. Most importantly it contains a definition of each Work Package which can be thought of as a mini scope statement. Resources on the project will look at the WBS dictionary to determine the scope of the Work Package they've been assigned.

Chart 20. WBS Dictionary (Source: A. Jn. Baptiste, the Author, 2019)

Level	WBS Code	Element Name	Definition
1	1	Package 1-FAARP II	All work to rehabilitate the Piat road.
2	1.1	Pre-Construction Services	Pre-Construction Services encompasses deliverables associated with the development, implementation and control of the project's schedule, budget and scope, including the solicitation for a consultant and contractor and execution of a construction contract. The lead office develops these project parameters as project baseline documents in the early stages of Construction. The baseline documents serve to help manage the project's development.
3	1.1.1	Procurement of Consultants	Procurement of Consultants according to the Caribbean Development Bank's procurement guidelines and the Finance Act of Saint Lucia.

Level	WBS Code	Element Name	Definition
3	1.1.2	Design and Cost Review	Undertake the necessary to carry out a thorough review of all project documents such as the Materials Report, Design Report, Environmental and Social Impact Assessment Report, Specifications, Bid Documents and Budget among others to ensure conformity to requirements.
3	1.1.3	Procurement of Works Contractor	Procurement of Contractor according to the Caribbean Development Bank's procurement guidelines and the Finance Act of Saint Lucia.
2	1.2	Construction	The Contractor undertakes the necessary to carry out the full rehabilitation of the Piat road in a sustainable manner in compliance with the works contract as guided by the works specifications to deliver the project deliverables within the constraints of time, budget, scope and quality.

Level	WBS Code	Element Name	Definition
3	1.2.1	Drainage	The Contractor undertakes all drainage works as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.2	Retaining Walls	The contractor undertakes all works related to Retaining Walls as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.3	Slope Stabilization	The contractor undertakes all slope stabilization works as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.

Level	WBS Code	Element Name	Definition
3	1.2.4	Road	The contractor undertakes all road works as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.5	New Culvert Construction	The contractor undertakes new culvert construction works as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.6	Bus Laybys	The contractor undertakes the construction of all Bus Lay Byes as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.

Level	WBS Code	Element Name	Definition
3	1.2.7	Traffic Safety Devices	The contractor installs all traffic safety devices as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.8	Road Markings	The contractor undertakes all road markings as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.9	Vertical Roads Signs	The contractor installs all vertical road signs as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.10	Culvert Repair	The contractor undertakes all culvert repair works as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.

Level	WBS Code	Element Name	Definition
3	1.2.11	Bus Shelters	The contractor undertakes all Bus Shelter construction as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.12	Bus Stops	The contractor undertakes the construction of all Bus Stops as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.
3	1.2.13	Utilities	The contractor carries out all necessary relocation of Utilities in consultation with the relevant Utility companies as specified in the contract in accordance with contract specifications, approved work schedule, within budget and in conformity with quality requirements.

Level	WBS Code	Element Name	Definition
2	1.3	Project Management and Supervision	All the project management and monitoring and control work by the supervisory consultant required to ensure successful delivery of the project deliverables and realization of project benefits within the constraints of time, budget, scope and quality.
2	1.4	Closure	This involves the issuance of the performance certificate, preparation of the final account, preparation of as built drawings, preparation of project closeout report and the closure of the Projects office.

4.2.9 Validate Scope

Scope verification should describe how the deliverables will be verified against the original scope and how they will be formally accepted. For best results, the project deliverables should be reviewed and approved by the sponsor throughout the lifecycle of the project and not held back as a single deliverable at the end of the project.

As Package 1 of FAARP-II progresses, the Project Director will verify interim project deliverables against the original scope as defined in the scope statement, WBS and WBS Dictionary. Once the Project Director verifies that the scope meets the requirements defined in the project plan, the Project Director and Sponsor will meet for formal acceptance of the deliverable. During this meeting the Project Director will present the deliverable to the Project Sponsor for formal acceptance.

The Project Sponsor will accept the deliverable by signing a project deliverable acceptance document. This will ensure that project work remains within the scope of the project on a consistent basis throughout the life of the project.

Chart 21. Template for Scope validation. Source: Department of Finance and Administration of the Government of Tennessee, 2014)

Scope Management

Milestone	In Scope	Out Scope	Date	Deliverable

4.2.10 Scope Control

Scope control is the process of monitoring the status of the scope of the project. This section also details the change process for making changes to the scope baseline.

The Project Director and the project team will work together to control the scope of Package 1 of FAARP-II. The project team will leverage the WBS Dictionary by using it as a statement of work for each WBS element. The project team will ensure that they perform only the work described in the WBS dictionary and generate the defined deliverables for each WBS element. The Project Director will oversee the project team and the progression of the project to ensure that this scope control process is followed and progress is reported through Project Scope measurements tools.

If a change to Package 1 of FAARP-II scope is needed, the process for recommending and estimating changes to the scope of the project must be carried out. Any project team member or Sponsor can request changes to the project

scope. All change requests must be submitted to the Project Director in the form of a project change request document. The Project Director will then review the suggested change to the scope of the project. The Project Director will then either reject the change request if it does not apply to the intent of the project, or convene a Change Control meeting between the project team and Sponsor to review the change request further and perform an impact assessment of the change. If the change request receives initial approval by the Project Director and Sponsor, the Project Director will then formally submit the change request to the Change Control Board. If the Change Control Board approves the scope change the Project Sponsor will then formally accept the change by signing the project change control document. Upon acceptance of the scope change by the Change Control Board and Project Sponsor the Project Director will update all project documents and communicate the scope change to all project team members' stakeholders.

4.2.11 Acceptance

Approved by:

_____ Date:_____

Approvers Name

Package 1 of FAARP-II Primary Sponsor-DIPE

_____ Date:_____

Approvers Name

Package 1 of FAARP-II Secondary Sponsor-CDB

_____ Date:_____

Approvers Name

Package 1 of FAARP-II Project Director/Manager

4.2.12 Requirements Management Plan

4.2.12.1 Introduction

The Requirements Management Plan establishes how requirements will be collected, analysed, documented, and managed throughout the lifecycle of the project. Depending on the type of project there may be both project and product requirements. It is easy to unintentionally omit requirements, fail to document them, or leave requirements incomplete without a tool to properly manage them.

The purpose of the FAARP-II Requirements Management Plan is to establish a common understanding of how requirements will be identified, analysed, documented, and managed.

The inputs for the requirements management plan include the Project Charter and Stakeholder Register.

4.2.12.2 Requirements Management Approach

The requirements management approach is the methodology the project team will use to identify, analyse, document, and manage the project's requirements. The PMBOK defines this approach as "How requirements activities will be planned, tracked, and reported."

The approach to be used for requirements management for the FAARP-II project is broken down into four areas: requirements identification, requirements analysis, requirements documentation, and ongoing requirements management.

Requirements Identification: The FAARP-II project team will facilitate various methods to collect requirements which may include: interviews, focus groups, facilitated workshops, group creativity techniques, questionnaires and surveys. These will be conducted among the project stakeholders to ensure all requirements are captured.

Requirements Analysis: The FAARP-II project team will analyse requirements to determine if they fall into project or product categories. Additionally, this analysis

will determine where in the WBS the requirements will fall or what work activities correspond to particular requirements. Accountability and priority for each requirement will also be determined as part of the analysis. Finally, metrics and acceptance criteria must be determined for all requirements in order to provide a baseline for understanding when a requirement has been fulfilled to an acceptable level.

Requirements Documentation: Once requirements have been identified and analysed, they will be documented and assigned to accountable personnel. These requirements will be added to the FAARP-II project plan and the project team will determine what methodology the accountable personnel will use to track and report on the status of each requirement. All requirements will also be added to the project requirements checklist which must be completed before formal project closure is accepted by the project sponsor.

Ongoing Requirements Management: Throughout the project lifecycle, the project manager will ensure all team members are reporting requirement status and raising any issues or concerns with their assigned requirements as appropriate. As the project matures there may be situations in which requirements must change or be altered in some way. The project team must follow the established change control process in order to propose any changes to requirements and receive approval from the change control board. Ongoing requirements management also includes receiving approval of all requirements by all vested parties as part of project closure.

4.2.12.3 Configuration Management

In order to effectively manage a project, communication must be managed and controlled. There will be situations which require changes to a project or its requirements. In these situations, configuration management will be utilized to consider proposed changes, establish a process to review and approve any proposed changes, and to implement and communicate these changes to the stakeholders

For the FAARP-II Project, the Requirements Management Plan will utilize the configuration management activities outlined in the Configuration Management Plan. Key items include documentation/version control and change control:

Documentation and Version Control: All project documentation will be loaded into the Configuration Management Database (CMDB) as the central repository for the FAARP-II Project. Appropriate permissions will be granted to the project team for editing and revising documentation. Any proposed changes to project requirements must be reviewed by the Configuration Control Board (CCB) (Project Steering Committee) and have written approval by the project sponsor before any documentation changes are made. Once these proposed changes are approved and the documentation is edited, the project manager/project director will be responsible for communicating the change to all project stakeholders.

Change Control: Any proposed changes in project requirements must be carefully considered before approval and implementation. Such changes are likely to impact project scope, time, and/or cost, perhaps significantly. Any proposed changes to project requirements will be reviewed by the CCB. The role of the CCB is to determine the impact of the proposed change on the project, seek clarification on proposed change, and ensure any approved changes are added to the CMDB. The project sponsor, who also sits on the CCB, is responsible for approving any changes in project scope, time, or cost and is an integral part of the change review and approval process.

4.2.12.4 Requirements Prioritization Process

The FAARP-II project manager will facilitate stakeholder meetings in order to establish priorities for all project requirements. For prioritizing the project requirements, the Full Analytical Criteria Method will be used. This is a three-step process that begins with the L shaped matrix developed to prioritize customer requirements, applies the L-shaped matrix to individual customer requirements, and then combines the results into a single matrix of project priorities.

4.2.12.5 Product Metrics

Product metrics for the FAARP-II project will be based on cost, quality, and performance requirements as outlined in the project charter. In order to achieve project success, the FAARP-II product must meet or exceed all established metrics.

FAARP-II Package 1- (Piat Road):

Cost

- The base cost of the project shall not exceed $2,075,263.33.

Quality:

- Geometric and Geotechnical Designs to be in accordance with the UK Transport and Road Research Laboratory (TRRL)-Road note 6, British Standards, Euro code and AASHTO (American Association of State, Highway and Transportation Officials) standards.
- Construction shall be in accordance with:
  - British Standard – BS594987:2010
  - The UK National Design Standards and Guidelines (Design Manual for roads and bridges)
  - Specifications for Highway Works developed by the UK Department of Transport
  - AASHTO
- Minimum California Bearing Ratio (CBR) value for road sub base shall be 25% on samples which have been compacted at optimum moisture content and soaked for 96 hours.
- The crushed aggregate base course material shall have a 4-day soaked CBR of not less than 80% when compacted at 100% of modified proctor AASHTO.
- Marshall test specimens from the asphalt mix or the cored samples from the pavement shall not fall below 100% and 97% of the laboratory Marshall density, or the values of the Marshall stability/flow ratio respectively.
- Compressive strength of concrete to be no less than 14 N/mm^2 in 7 days.

Performance:

- International Road Roughness Index to be less than or equal to 3 on completion of the new road pavement (IRI<=3)
- Travel time over the length of road reduced from 15 minutes /km to 10 minutes/km under free flow conditions
- New drains capable of handling flows of at least a 1 in 5-year rainfall event.
- Improvement in traffic safety rating from a 2 star to at least a 3 star.

4.2.12.5 Requirements Traceability Matrix

Below is the requirements traceability matrix template for the FAARP-II (Piat) project. The purpose of the requirements traceability matrix is to ensure all product requirements are completed in accordance with the project charter. This matrix provides a thread from all product requirements through design, testing, and user acceptance. Design document and charter references are contained in the FAARP-II Project Configuration Management Plan. Any approved changes in project scope or requirements will result in changes to the traceability matrix below. Based on impacts of the approved changes, the Project Manager will make the necessary changes to the matrix and communicate those changes to all project stakeholders.

Chart 22. Requirements Traceability Matrix Template (Source: Projectmanagementdocs.com, 2019)

Project Name	FAARP-II (Piat)	Business Area	Technical-Roads			
Project Manager	Chief engineer	Business Analyst Lead	Team member			
QA Lead	Team Member	Target Implementation Date	01/04/2021			
Req. #	Requirement Description	Design Document Reference	WBS Reference	Test Case Reference	User Acceptance Validation	Comments
1	Reduce vehicle operating cost by 15%	DD001	1.2.4	TS001		
2	Reduce travel time per km by 30%	DD002	1.2.4,1.2.8	TS002		
3	Reduce road roughness from an average IRI of 6 to an IRI of 3 or less	DD003	1.2.4	TS003		
4	Increase drain capacity by 20%	DD004	1.2.1,1.2.5,1.2.10	TS004		
5	Reduce the incidence of vehicular accidents by at least 30%	DD005	1.2.4,1.2.6,1.2.7,1.2.8,1.2.9	TS005		
6	Reduce the incidence of slope failure by 40% for a rainfall event not exceeding an Annual Exceedance Probability of 2%.	DD006	1.2.2,1.2.3	TS006		

4.2.12.6 Requirements Identification

This project must fulfil the following requirements:

- Design must fulfil the requirements of British Standard – BS594987:2010 and AASHTO.
- Drawings must be stamped by a professional engineer licensed in the country.
- Tender documents must follow the standard construction templates for civil engineering projects.
- Project management must conform to the client's Project Administration Manual.
- Safety must be governed by Saint Lucia's Health and Safety Regulations.
- Adjacent landowners must be satisfied with the final product.
- The sponsor (DIPE) must be satisfied with the project outcome.
- The surrounding roads must be left in at least the same condition they were originally found in.
- The road finished surface must lead to minimum Vehicle Operating Cost (VOC).
- Environmentally compliant-dust and noise nuisance must be kept to a minimum through the life of the project.
- The project completion inspection must be performed by 1st April, 2022.
- Design review must be complete by 30th November, 2020.
- Reduced vehicle operating Cost.
- Reduced travel time per kilometre.
- Reduced road roughness.
- Reduced vehicular accidents.
- Reduced incidence of slope failure.

4.2.12.7 Requirements Analysis

This section provides a discussion of each key requirement, what its root causes are, and how to manage them.

- Tender documents will need to follow the standard templates approved by the Caribbean Development Bank (CDB). They sometimes change without notice; thus, care needs to be taken to check for conformity before submission.
- Adjacent landowners are unpredictable project stakeholders. They can value their land differently than one another and can have drastically different perspectives and attitudes towards the road project, even if the effects they are experiencing from the project are the same.
- The project must have zero dust and noise nuisance, but this might not be practically possible. Budget needs dictate that the DIPE might not be able to get zero nuisance. This might require dialog to ensure sponsor requirements are met.
- The finished road must perform at an IRI<=3. If this is not possible, an IRI<=4 could suffice as long as the surface is monitored for increased roughness during the defects liability period. Under no circumstances can the finished road have an IRI>4.
- The project commissioning must take place by 1st April, 2022, but if the sponsor holds up the project due to slow reviews, or any other reason, the commissioning could be extended as required.

4.2.12.8 Requirements Prioritization

The most important requirements are prioritized here.

- Reduced VOC
- Reduced travel time
- Reduced road roughness
- Environmentally compliant
- Reduced accidents

- The Department of Labour's Health and Safety policy governs for this project, however during construction, the Contractors safety policy will take precedence, if it exists.
- The project completion inspection must be performed by 1st April, 2022, but if the design review of the project packages requires more time, the completion date must be extended.
- The client/sponsor must be satisfied with the project outcome, but it is more important if the CDB (the financier) is satisfied than the sponsor.
- The surrounding roads must be left in at least the same condition they are found in, but if construction traffic creates only dirt stains on the road, this does not require the expenditure to fix.

4.2.12.9 Requirements Management and Control

This section identifies how the requirements will be managed and controlled. It requires a plan to revisit and re-approve the requirements on a regular basis to ensure they have not changed.

- Since the surrounding landowners are unpredictable stakeholders that could radically affect the outcome of the design, the feedback of each landowner should be solicited at each step of the design process. After receiving comments from all landowners, the scope of the project should be revisited and re-approved.
- The project will be analysed biweekly/monthly whichever is more appropriate to ensure the road will achieve the required performance level. If at any time there is uncertainty that it will achieve the performance target, the project management board/project steering committee will meet to review the evidence and decide upon a further course of action.
- The schedule will be re-calculated biweekly/monthly whichever is most appropriate and documented in the project management plan appendices. If the commissioning date of the road appears to be unachievable, the project team must inform the client/sponsor immediately.

4.2.12.10 Roles and Responsibilities

- The project manager is responsible for collecting, reviewing and developing project requirements. He will also be responsible for approving technical and project requirements.
- The project sponsor is responsible for providing client requirements, reviewing technical requirements and approving requirements.
- The consultant is responsible for providing technical requirements and any variation in the technical requirements as they relate to all aspects of the works.
- The project team members are responsible for reviewing requirements to ensure details are specific and accurate.

4.3. Schedule Management

4.3.1 Schedule Management Plan

This Schedule Management Plan defines how the project schedule is managed throughout the project lifecycle for FAARPII by using package 1 as an example. The plan provides guidance and sets expectations for project schedule policies and procedures for planning, developing, managing, executing, and controlling the project schedule.

As a tool, project schedule will be used to communicate what work needs to be performed, which resources of the organization will perform the work, and the timeframes in which that work needs to be performed. The project schedule will reflect all of the work associated with delivering the project on time.

4.3.1.1 High-Level Workflows and Activities

This section identifies the list of Schedule Management processes, activities, and tasks that will be defined and implemented to establish and manage the project schedule. The identified Schedule Management processes include, but are not limited to:

- **Develop Project Schedule** – An integrated process consisting of defining activities, sequences, and required resources to complete the project deliverables.
- **Monitor and Control Schedule** – The process of monitoring and reporting on the progress of project activities as well as managing progress and changes to the schedule baseline to achieve project objectives. If necessary, based on factors such as project size and complexity, the process may be broken down into sub-processes. For example:
- **Schedule Activity and Progress Updates** – The process of establishing how and at what intervals project activity and progress updates will be collected during the project.
- **Schedule Monitoring** – The process of establishing how schedule progress updates are compared to the schedule baseline.
- **Schedule Control** – The process of establishing the control tools and techniques for how the schedule will be managed and how changes will be addressed.
- **Schedule Reporting** – The process of defining what schedule reporting metrics and reports are necessary for the project, at what intervals reporting should occur, and to what audiences.

4.3.1.2 Tools and Method

The schedule will be developed in the Department's standard project schedule tool, Microsoft Project using the approved Work Breakdown Structure document as its basis. The schedule will be managed by the process defined in this

schedule management plan. It will also be managed as a configured item through the project's configuration control process.

The FAARP II Implementation phase schedule will be based on the Critical Path Method (CPM). The CPM determines the minimum total project duration and the earliest possible project finish date. Total float durations for activities are calculated using CPM. Early start date and finish dates are calculated for each activity by performing a forward pass from a specific project date. Late start and late finish dates are calculated by performing a backward pass on all activities starting from the earliest project finish date.

Activities with zero float will be identified as being Critical Path activities. Any activities with less than zero days' float (negative float) will be reviewed and corrected as negative float contained within the project schedule suggests the project end date is not attainable. As mentioned earlier the FAARPII Implementation phase schedule will use Microsoft Project as the Scheduling Tool.

4.3.1.3 Roles & Responsibilities

Chart 23. Roles and Responsibilities (Source: A. Jn. Baptiste, 2019)

Name	Role	Responsibility
Permanent Secretary	Project Sponsor	• Reviews and approves final schedule baseline and schedule progress reports. • Provides overall guidance and mentoring.
Chief Engineer	Project Manager	• Leads the team in the development of the Schedule Management Plan and the Project Schedule.

Name	Role	Responsibility
		• Leads the project team in Schedule Management related activities. • Reviews, evaluates and provides feedback on schedule progress reports and time-risk recommendations from the Project Scheduler. • Provides regular status information in meetings with the Project Sponsor and steering committees.
Project Consultant	Project Scheduler	• Assists in the update of the Schedule Management Plan. • Responsible for the daily schedule-related analysis and update activities. • Leads the schedule management activities, communicates schedule status, maintains the project schedule and provides updates. • Makes schedule risk, issue and change recommendations to the Project Manager. • Is considered the subject matter expert for the Schedule Management processes.
To be determined	Project Team Members	• Notifies the Project Manager and Project Scheduler about possible

Name	Role	Responsibility
		schedule risks and issues. • Assists with schedule estimating activities. • Provides accurate time estimates for project work packages. • Provides accurate progress reporting during the project.

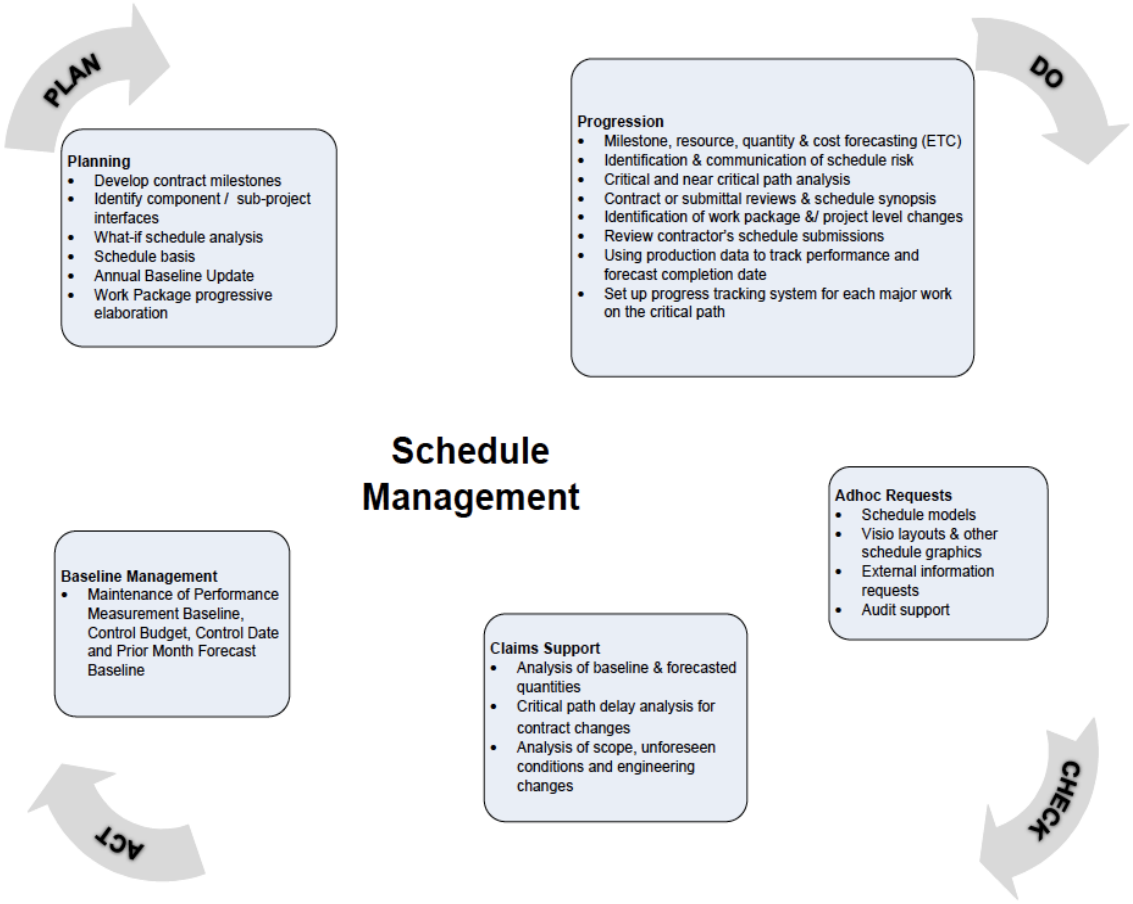


Figure 24 Scheduler's Role (BC Hydro Schedule Management Plan-April 8th, 2015)

4.3.1.4 Schedule Management Process

The schedule for FAARPII will be based on the Project Charter, requirements definition, WBS and WBS Dictionary for the Project as outlined in the Scope Management Plan. The project team will work together to determine the correct task definition, sequencing, and estimating for all work detailed in the WBS. The project schedule will be a result of all required project work in the correct sequence while accounting for all task dependencies and required resources as defined in the WBS Dictionary.

Once developed, the Project Sponsor will review the schedule, communicate any necessary modifications to the Project Manager, and approve the schedule once any required changes are made.

The FAARPII Project Schedule will be created as a Gantt Chart in MS Project. As tasks are completed, the Project Manager will update the schedule accordingly in order to provide awareness of the project schedule to all team members.
Schedules for this project will be managed at the individual task level, where each task reflects a task identified at the lowest level of the approved Work Breakdown Structure (WBS). Task durations will be measured in terms of hours and/or days, as appropriate. Critical path method will be used to control and monitor the schedules.

Boundary conditions for FAARPII are as follows:
CPI less than 0.8 or greater than 1.2
SPI less than 0.8 or greater than 1.2

Once a change request has been approved, the changes will be implemented and the Project Manager is responsible for updating the project schedule, all project plans/documentation, and communicating the change(s) to all project participants. If the impact of the change request requires any changes in the project's scope, then it will follow the process defined in the Scope Management Plan.

4.3.1.5 Schedule Development

The project schedule will be developed from the approved work breakdown structure (WBS) constructed as part of the Scope Management planning effort. The project manager and project scheduler will identify task durations associated with each task. They will also conduct a dependency analysis to determine the order in which the work must occur. Tasks, their associated activities, and durations will be entered into the project schedule software tool, Microsoft Project 2016/2019 with both predecessor and successor tasks assigned at the activity level. Task sizing will be within the project's established work package limits for both effort and duration. Named resources will be assigned to each task. If named resources are not known, then resource groups will be assigned to the task. Once completed, the Project Manager will examine the schedule to ensure it is technically correct and reasonable. After the schedule is approved, the project will be baselined and put under configuration control.

Since contractors will be sourced for each contract package the schedule developed for each package by the Project Manager will be adjusted once the selected contractor has submitted an approved work schedule. These work schedules will include any engineering, production, manufacturing, installation, testing and commissioning schedules, and other 3rd party schedules. The level of detail for integrating contractor schedule information should reflect the planned work in the context of enabling progress measurement.

Upon contract award vendors/contractors will submit to the Project Manager their Schedule and Program, which upon acceptance becomes the base schedule for the contract. The contractor will submit on a monthly basis, typically within three business days of the first day of each month, progressive amendments to the Base Work Program and Schedule describing the actual progress of the work current to the last day of the previous calendar month and incorporating any time adjustments. Contractors will amend their scheduling using critical path methodology.

The contractors will also, on a weekly basis (or other frequency as described in the contract) submit a detailed three week look ahead schedule showing all aspects of work including critical path activities, equipment deliveries, estimated quantities, anticipated delays, etc. The three-week look ahead also shows the contractors actual progress of work for the preceding week.

Once the contractor's schedule is accepted as a baseline, the contractor's schedule will be integrated into appropriate work packages. All contract milestones will be added to work packages. On a monthly basis the Master Schedule will be updated with contractor schedule information. Should the Project Manager accept a new baseline from a contractor, the Performance Measurement Baseline may be updated to reflect that.

The assigned work package manager will ensure that any third-party schedule follows the procedures for the development, control, and maintenance of schedules. The assigned Scheduler will be responsible for checking for conformance with the contract document and contract requirements as well as identifying emerging schedule risks.

Standard contract wording will also be included in any contractor agreement to reflect the requirements of this procedure.

4.3.1.6 Units of Measure and Level of Accuracy

Human resource measurements are hours, days, weeks, and months. No other fractions or portions of identified measures are used for the project. For measuring the project resource's activity durations, the level of accuracy for the project is considered plus or minus 10%.

4.3.1.7 Schedule Maintenance

Team members are trained on how to record time in the schedule software tool. The Project Manager and Project Scheduler review the project status and report progress weekly in the project schedule software application.

4.3.1.8 Project Schedule Metrics

The project will use Schedule Variance and Schedule Performance Index (SPI) as the basis for measuring schedule performance. In addition, the project will track two additional data points in order to improve estimation accuracy.

- **Percentage of Tasks on Time** – Measures the percentage of tasks that finish on or ahead of their planned finish date.
- **Percentage of Tasks on Budget (Effort)** – Measures the percentage of tasks that are completed within their allocated time budget.

4.3.1.9 Control Thresholds

If a team member feels a schedule change is necessary, the Project Manager and the team meet to review and evaluate the change. The project team determines which tasks are affected, calculates the variance, and generates a list of possible alternatives for consideration. If, after the evaluation is complete, the Project Manager determines that any change exceeds the established thresholds or boundaries, a change request is submitted to the Change Control Board (CCB).

A change request is necessary if either of the following two conditions is true:

- The proposed change is estimated to increase or reduce the work package duration by 10% or more when compared against the baseline.
- The proposed change is estimated to increase or reduce the overall project duration by 10% or more when compared against the baseline.

Once the schedule change request is reviewed and approved, the Project Manager and Project Scheduler record the change request result, store the documents in the project repository, modify the schedule according to the approved change, and communicate the change and impacts to the project team

and Stakeholders. If the project team feels a schedule re-baseline is necessary, a separate change request is submitted for consideration and approval.

4.3.1.11 Reporting Formats

The following scheduled reports as detailed in Chart 24 will be made available at the specified time intervals during the project:

Chart 24. Reporting Format (Source: A. Jn. Baptiste, 2019)

Report	Frequency	Author	Reporting Responsibility
Resource Task Lists and Work Packages	Weekly	Project Scheduler	Generate individual resource task lists and work packages from the scheduling tool and make them available online to project team members.
Project Schedule Report	Monthly	Project Scheduler	Generate the schedule progress report for use in the project status meeting.
Project Master Schedule (Gantt chart)	Monthly	Project Scheduler	Generate the updated schedule Gantt chart for use in the project status meeting.
Sponsor Project Report	Monthly	Project Manager	Generate the Sponsor project status report for presentation to the Project Sponsor.

4.3.1.12 Performance Measurement Rules

Performance measure calculations will be made using Microsoft Project 2016/2019.

4.3.1.13 Schedule Activity and Progress Update

Activity and progress updates are entered by project team members on a monthly basis into Microsoft project 2016/2019. The Project Scheduler verifies updates are

complete for the month and reviews the results with the Project Manager. Any input errors are submitted to the project team members for correction.

4.3.1.14 Schedule Monitoring

Project team members will report task progress on monthly basis to the Project Manager. The Project Scheduler will update the project schedule and inform the Project Manager of the overall condition of the project schedule in terms of variance from planned. The Project Scheduler will also report on positive or negative trends regarding schedule performance.

4.3.1.15 Schedule Control

The Critical Path Method will be used for schedule control. The Project Manager will review the critical path:

- Monthly
- When a new baseline is required
- When entering a new project phase
- When mitigating schedule-related risks
- As needed to ensure the critical path is maintained

4.3.2 Define Activities

On completion of the Plan Schedule Management exercise the Activity Definition process was undertaken for FAARP-II Package 1. The purpose of this process was to identify the specific tasks needed to be done in order to produce the project's deliverables. This was done in sufficient detail to estimate what resources and time will be required to complete them. The main inputs were the scope baseline consisting of the approved project scope statement, the work breakdown structure, and the WBS dictionary.

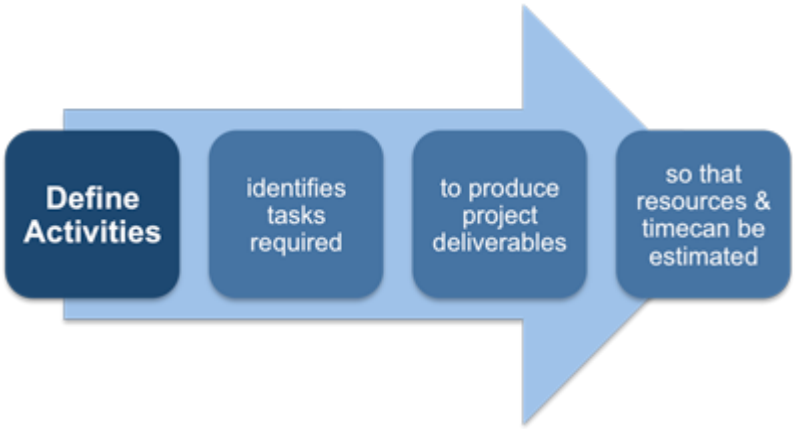


Figure 25.Function of Define Activities Process (Source A. Jn. Baptiste, 2019)

In this process decomposition was used to take the work packages identified in the WBS, to identify the activities required in order to complete them.

The scope baseline was used as a starting point to breakdown the documented deliverables, as well as a guide to assure that the entire scope of the project is covered, but that the activities do not extend beyond the agreed boundaries.

In order to produce the activity list it was necessary to examine each work package and break it down into individual work schedule activities using expert judgement. The activity list, is a list of all the activities that must be performed within the project and each one should be linked back to just one work package.

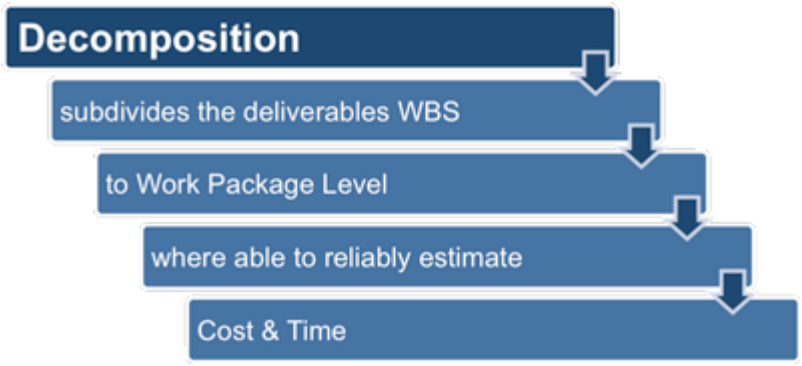


Figure 26.The process of decomposition in formulating the WBS (Source A. Jn. Baptiste, 2019)

The work packages which constitute the lowest level of the WBS were achieved when the work could be accurately estimated (both cost and duration) and managed by one individual. Care was taken to ensure that each activity was complete and accurate, because of their importance in developing the project schedule.

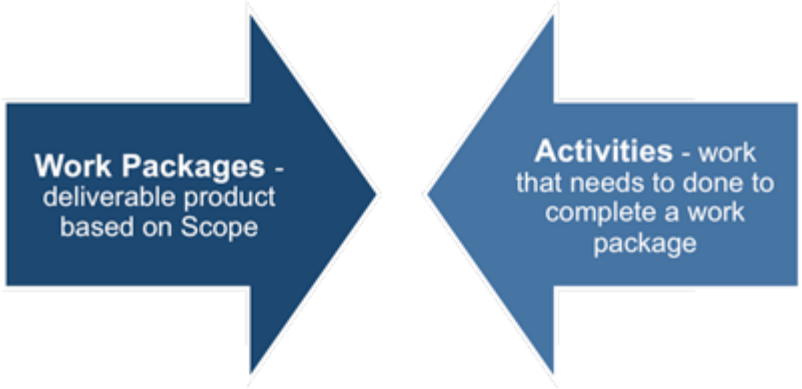


Figure 27.Work Packages vs Activities (Source A. Jn. Baptiste, 2019)

The intent behind decomposing the work packages into activities in this way was to create an activity list, which was then used to develop the project schedule. The work packages are product or deliverable based to deliver the scope of the project, whereas activities' focus on the work that needs to be carried out in order to execute such work packages. An activity has an expected duration and consumes resources in terms of manpower and/or budget. Where duration could not be meaningfully assigned to it then it was considered a milestone.

Figure 28.Progression from Work Package to Project Schedule (Source A. Jn. Baptiste, 2019)

The activity list, work breakdown structure, and WBS dictionary were developed sequentially, with the WBS and WBS dictionary as the basis for development of the final activity list. Each work package within the WBS was decomposed into the activities required to produce the work package deliverables. This decomposition was carried out involving as much expertise as necessary to ensure that the activities were accurately identified and of sufficient detail to create a realistic and feasible schedule.

The activity list developed under the Define Activity process is a comprehensive list including all schedule activities required by the project. The activity list includes the activity identifier and a scope of work description for each activity in sufficient detail to ensure the project team members understand what work is required to be completed.

Figure 29.Outputs of the Defining Activities Process (Source A. Jn. Baptiste, 2019)

The tool used to capture the output of this process and the remaining processes required to develop the schedule was Microsoft project 2016/2019.

The Activity list developed through the Define Activity process is given below in Chart 25.

An Activity Attribute list was not developed as an output to this process, as indicated in the PMBOK guide, because the information detailed in the Activity Attributes, such as the activity ID, activity description, WBS number, activity responsibility, predecessor scheduling and dependency, and successor scheduling and dependencies were already captured in other plans or matrices included in the FGP.

Chart 25. Activity List (Source: A. Jn. Baptiste, the Author, 2019)

WBS	Activity Code	Activity Name
1.1 PRE-CONSTRUCTION SERVICES		
1.1.1 Procurement of Consultants		
1.1.1.1	90	Commencement of procurement process for design review and supervision consultant
1.1.1.2	100	Procure consultants
1.1.1.3	120	Award of consultancy contract
1.1.2 Design and Cost Review		
1.1.2.1	150	Undertake traffic studies review
1.1.2.2	200	Undertake topographic surveys review
1.1.2.3	250	Undertake geotechnical studies review
1.1.2.4	300	Undertake utility assessment
1.1.2.5	350	Undertake Engineering designs review
1.1.2.6	400	Consult the public
1.1.2.7	450	Undertake cost estimate review
1.1.2.8	500	Prepare bid documents
1.1.2.9	510	Completion of design services
1.1.3 Procurement of Works Contractor		
1.1.3.1	515	Commencement of procurement process for works contractor
1.1.3.2	550	Procure works contractor
1.1.3.3	560	Award of Works Contract
1.2 CONSTRUCTION		
1.2.1 Drainage		
1.2.1.1	850	Dig earthen drains

1.2.1.2	900	Construct lined drains
1.2.1.3	950	Repair concrete drains
1.2.2 Retaining Walls		
1.2.2.1	1000	Construct retaining walls
1.2.2.2	1050	Repair masonry retaining walls
1.2.3 Slope stabilization		
1.2.3	800	Build slope stabilization
1.2.4 Roads		
1.2.4.1	1100	Construct road widening including ancillary works
1.2.4.2	1150	Place road sub base
1.2.4.3	1160	Place road base in road box
1.2.4.4	1360	Construct asphalt overlay to roads
1.2.5 New Culvert Construction		
1.2.5.1	700	Construct culvert foundation
1.2.5.2	710	Construct culvert
1.2.5.3	720	Construct formwork
1.2.5.4	730	Construct catch basins
1.2.5.5	740	Excavation for rip rap protection
1.2.5.6	750	Preparation of excavated surfaces
1.2.5.7	760	Geotextile material to existing ground
1.2.5.8	770	Construct rip rap protection
1.2.5.9	780	Construct asphalt overlay to culvert deck
1.2.5.10	790	Construct, install and paint railings to culvert
1.2.6 Bus Lay Byes		
1.2.6.1	1170	Construct concrete curbs to laybys at tourist viewpoints

1.2.6.2	1280	Place subbase/base in laybys at tourist view points
1.2.6.3	1370	Place asphalt to laybys at tourist viewpoints
1.2.6.4	1400	Construct Amenities
1.2.7 Traffic Safety Devices		
1.2.7	1440	Install traffic safety devices
1.2.8 Road markings		
1.2.8	1430	Place road markings
1.2.9 Vertical Road Signs		
1.2.9	1420	Erect vertical road signs
1.2.10 Culvert Repair and Reconstruction		
1.2.10.1	1300	Repair culverts
1.2.10.2	1310	Clean Culverts
1.2.11 Bus Shelters		
1.2.11	1390	Construction of bus shelters
1.2.12 Bus Stops		
1.2.12.1	1180	Construct concrete curbs to laybys at bus stops
1.2.12.2	1290	Place subbase/base in bus stops
1.2.12.3	1380	Place asphalt to bus laybys
1.2.12.4	1410	Erect signage to bus stops and tourist viewpoints
1.2.13 Utilities		
1.2.13.1	1320	Relocate telecommunication infrastructure
1.2.13.2	1340	Replace old water infrastructure with new
1.2.13.3	1350	Relocate power lines
1.3 SUPERVISION AND PROJECT MANAGEMENT		

1.3.1	650	Supervise works
1.3.2	600	Carry out kick off meeting
1.3.3	1450	Issue taking over certificate
1.3.4	1460	Undertake supervision during defects liability period.
1.3.2	80	Project management
1.4 PROJECT CLOSURE		
1.4.1	1500	Issue performance certificate
1.4.2	1480	Prepare final account for works contract
1.4.3	1490	Prepare project closeout report
1.4.4	1470	Prepare as built drawings
1.4.5	1510	Close project office

Chart 26. Activity Responsibility Matrix (Source: A. Jn. Baptiste, the Author, 2019)

Responsibility	Importance	Main Stakeholders	Tools & Techniques to be used
A. Design and prepare construction plans, technical specifications, cost estimates, quantity computations and related construction documents.	High	Design firm, Technical Department -DIPE, The Department of Physical Planning, Department of Agriculture, Ministry of Tourism, Design and Supervision Consultant and other agencies or interested stakeholders.	Experts, Meetings, Estimations, Decision Making
B. Design of proposed improvements which will include the reconstruction of the existing two-lane roadway consistent with the selected alternative in the Location/Design Concept Report (L/DCR). The design will consider construction staging, traffic control, temporary transitions and reuse of existing roadway where possible, drainage features and reconnection of local access. The project will also include DIPE designed major Bridge structures. The design of the project includes highway landscaping, multi-use pathways, co-ordination and design of Touristic amenities/ facilities.	High	Design firm, Technical Department -DIPE, The Department of Physical Planning, Department of Agriculture, Ministry of Tourism, Design and Supervision Consultant and other agencies or interested stakeholders.	Experts, Meetings, Estimations, Decision Making
C. Design all mitigation measures identified in the final L/DCR and Environmental Impact Statement (EIS). Work that is of landscape architectural in nature may require professional expertise for the agronomic, architectural components of the projects as needed including	High	Design firm, Technical Department -DIPE, The Department of Physical Planning, Department of Agriculture, Ministry of Tourism, Design and Supervision Consultant and other agencies or interested stakeholders.	Experts, Meetings, Estimations, Decision Making
E. Provide post design services as necessary for successful construction of the project.	High	Design firm,	Experts, Meetings, Estimations, Decision Making
F. Develop a plan for the design and pre-construction activities necessary for delivering the project in a timely manner consistent with the length of service described. The plan shall include a list of activities, estimated duration and resources as well as a Critical Path Method (CPM)schedule and other information as appropriate. The consultant shall provide a schedule of major project milestones.	High	The Consultant	Experts, Meetings, Estimations, Decision Making

Responsibility	Importance	Main Stakeholders	Tools & Techniques to be used
G. Provide a CPM schedule compatible to the Primavera scheduling system, MS Project or similar. It shall include the milestones/flags requested by DIPE. An initial schedule shall be submitted within 6 weeks of the Notice to Proceed. The schedule submitted shall be customized to reflect the specific needs of the project. Work elements for which DIPE has responsibility shall be included in the schedule.	High	The Consultant, DIPE	Experts, Meetings, Estimations, Decision Making
H. Include status activities in the schedule in accordance with a schedule furnished by DIPE. Changes to the schedule logic will be submitted to the Project Manager for approval. If the milestones show negative float, the Consultant shall include a narrative of corrective solutions to put the design schedule back on time for delivery.	High	The Consultant, DIPE	Experts, Meetings, Estimations, Decision Making
I. Schedule and attend a regularly scheduled monthly progress meeting. The Consultant shall document the progress meeting through Meeting notes ("minutes"), which shall be distributed to the team within 10 calendar days of the meeting.	High	The Consultant ,	Experts, Meetings, Estimations, Decision Making
K. Supervise of Works in accordance with the FIDIC General conditions of Contract for Works Designed by the Client.	High	FIDIC General, The Client	Experts, Decision Making
· Repair and construct drainage.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Repair and construct retaining structures.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Implement slope stabilization mechanisms.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Reconstruct road.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Construct culvert as per DIPE’s approved designs.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization,

Responsibility	Importance	Main Stakeholders	Tools & Techniques to be used
			Leads & Lags, Critical Path method
· Establish Laybys at Touristic Viewpoints.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Place traffic safety devices at all accident hotspots.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
Establish road markings according to the British Traffic Signs Manual reconstructed road.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Install Vertical road signs according to the British Traffic Signs Manual as per design.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Repair culverts.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
. Install Bus Shelters.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method
· Construct Bus Stops.	High	Project Manager, Contractors, The Consultant and Designer	PM info, Schedule Network Analysis, Design Analysis, Resource Optimization, Leads & Lags, Critical Path method

4.3.3 Sequence Activities

4.3.3.1 Introduction

In the process of sequencing activities in project management, the project manager identifies and records relationships among the various project activities so that he can define the best logical sequence that can produce the greatest efficiency. The project management sequence activities process is diagrammatically represented below.

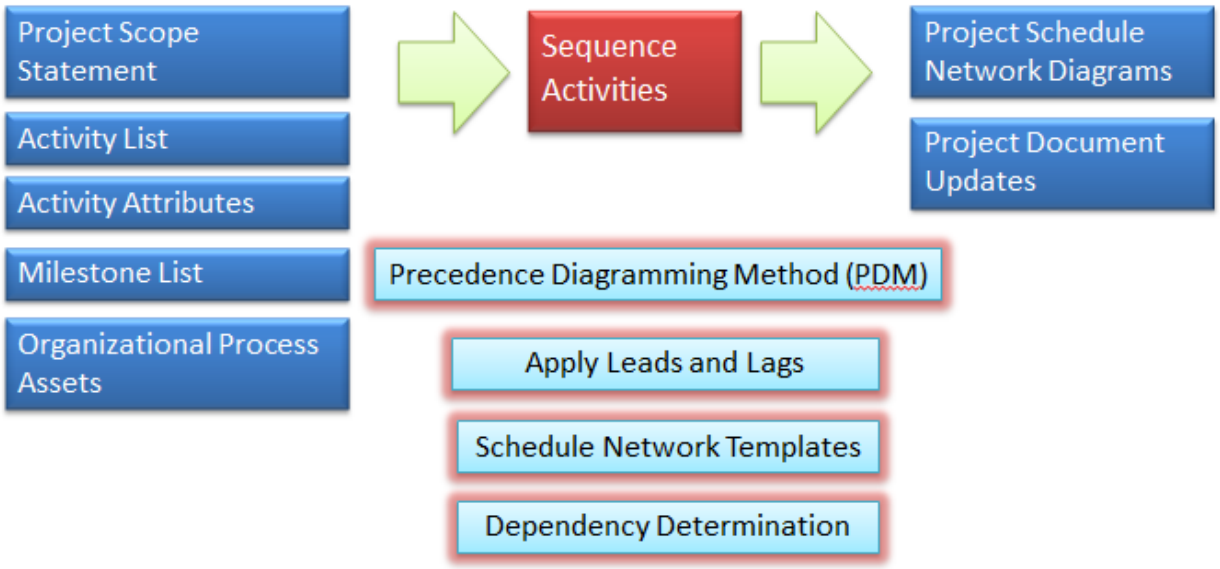


Figure 30.The Sequencing Activities Process (A. Jn. Baptiste, 2019)

Once all the activities were identified and defined in the process of “define activities”, they were placed in order of precedence in the “sequence activities” process. A map/diagram was created that effectively illustrated the relationship existing between these activities and identified the order or sequence in which they need to be performed. The results of this process serve an input into the develop schedule process.

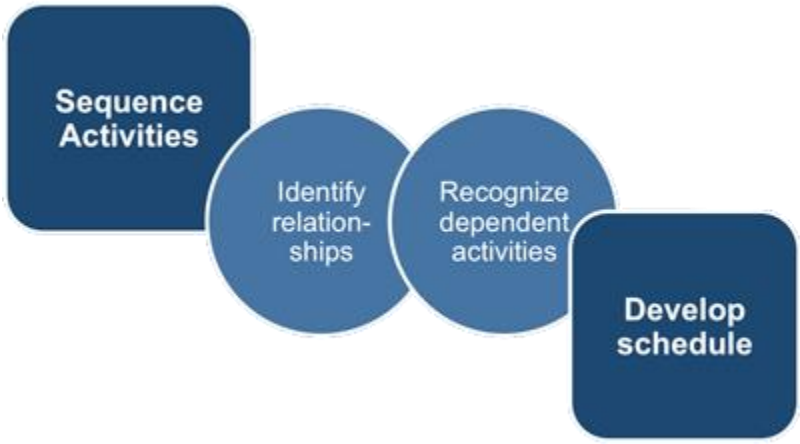


Figure 31.Progression from Sequencing Activities to Develop Schedule (Source A. Jn. Baptiste, 2019)

4.3.3.2 Inputs for Activity Sequencing

The inputs for the sequence activities process included: activity attributes, project scope statement, activity list, milestone list, as well as organizational process assets. The activity list created previously contains the scheduled activities and was arranged in the order in which tasks/sub-tasks need be performed. The attributes of the activities chosen provided additional insight into the activities that need to be addressed before others. Additionally, the milestone list offered the key milestones which might influence the overall order of all activities.

The project scope statement was used to ensure that all aspects of the project were covered as it influences the activity performance order.

4.3.3.3 Tools for Creating Activity Sequences

In carrying out the activity sequencing process four tools were used:

- Precedence Diagramming Method (PDM)
- Determination of dependency
- Application of leads and lags
- Schedule network templates

4.3.3.4 Outputs for Activity Sequencing

The outputs from the activity sequencing process encompass the project schedule network diagram and any other project document updates that may be necessary. The network diagram represents the dependencies of activities and is not the schedule. The timeframes and schedules are developed through an altogether different process. The diagram presented below includes the summary nodes of activities.

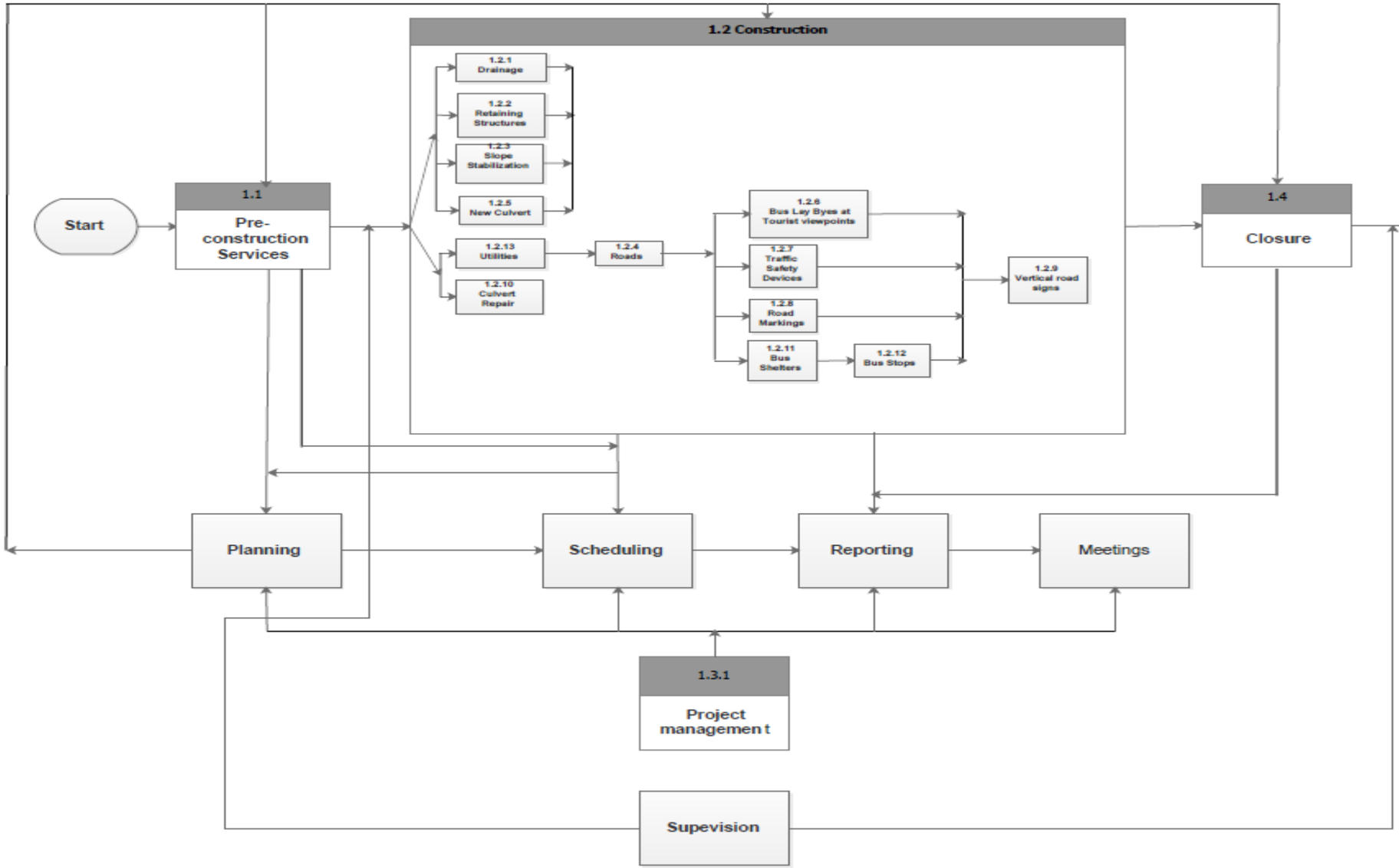


Figure 32. Network diagram for FAARPII-Package 1 (Piat Road) (Source A. Jn. Baptiste, 2019)

Chart 27. Activity Responsibility Matrix (Source: A. Jn. Baptiste, the Author, 2019)

WBS	Activity Code	Activity Name	Predecessors	Successors
1.1 PRE-CONSTRUCTION SERVICES				
1.1.1 Procurement of Consultants				
1.1.1.1	90	Commencement of procurement process for design review and supervision consultant	None	100
1.1.1.2	100	Procure consultants	90	150,200,250,300,350
1.1.1.3	120	Award of consultancy contract	100	150,200,250,300,350
1.1.2 Design and Cost Review				
1.1.2.1	150	Undertake traffic studies review	100,120	350,400
1.1.2.2	200	Undertake topographic surveys review	100,120	350,400
1.1.2.3	250	Undertake geotechnical studies review	100,120	350,400
1.1.2.4	300	Undertake utility assessment	100,120	350,400
1.1.2.5	350	Undertake Engineering designs review	100,120,150,200,250,300	450
1.1.2.6	400	Consult the public	150,200,250,300	450
1.1.2.7	450	Undertake cost estimate review	350,400	500
1.1.2.8	500	Prepare bid documents	450	550
1.1.2.9	510	Completion of design services	500	515
1.1.3 Procurement of Works Contractor				
1.1.3.1	515	Commencement of procurement process for works contractor	510	550
1.1.3.2	550	Procure works contractor	500,515	560,600
1.1.3.3	560	Award of works contract	550	600,650
1.2 CONSTRUCTION				
1.2.1 Drainage				
1.2.1.1	850	Dig earthen drains	600	1150,1280,1290
1.2.1.2	900	Construct lined drains	600	1150,1280,1290
1.2.1.3	950	Repair concrete drains	600	1150,1280,1290

1.2.2 Retaining Walls				
1.2.2.1	1000	Construct retaining walls	600	1150,1280,1290
1.2.2.2	1050	Repair masonry retaining walls	600	1150,1280,1290
1.2.3 Slope stabilization				
1.2.3	800	Build slope stabilization	600	1150,1280,1290
1.2.4 Roads				
1.2.4.1	1100	Construct road widening including ancillary works	600,1350	1150
1.2.4.2	1150	Place road sub base	1300,1310,850,900,950,1000,1050,1100,1320,1340	1160
1.2.4.3	1160	Place road base in road box	1150	1360
1.2.4.4	1360	Construct asphalt overlay to roads	1160	1440,1430
1.2.5 New Culvert Construction				
1.2.5.1	700	Construct culvert foundation	600	720
1.2.5.2	710	Construct culvert	720	780
1.2.5.3	720	Construct formwork	700	710
1.2.5.4	730	Construct catch basins	710	740
1.2.5.5	740	Excavation for rip rap protection	730	750
1.2.5.6	750	Preparation of excavated surfaces	740	760
1.2.5.7	760	Geotextile material to existing ground	750	770
1.2.5.8	770	Construct rip rap protection	760	1450
1.2.5.9	780	Construct asphalt overlay to culvert deck	710	790
1.2.5.10	790	Construct, install and paint railings to culvert	780	1450
1.2.6 Bus Lay Byes at Tourist Viewpoints				
1.2.6.1	1170	Construct concrete curbs to laybys at tourist viewpoints	1280	1370
1.2.6.2	1280	Place subbase/base in laybys at tourist view points	850,900,950,1000,1050,1100	1370,1170
1.2.6.3	1370	Place asphalt to laybys at tourist viewpoints	1280,1170,1400	1390,1400,1410
1.2.6.4	1400	Construct Amenities	1370,1410,1450	1420,1430,1440
1.2.7 Traffic Safety Devices				
1.2.7	1440	Install traffic safety devices	1360	1450

1.2.8 Road markings				
1.2.8	1430	Place road markings	1360	1450
1.2.9 Vertical Road Signs				
1.2.9	1420	Erect vertical road signs	1360	1450
1.2.10 Culvert Repair and Reconstruction				
1.2.10.1	1300	Repair culverts	600	1150
1.2.10.2	1310	Reconstruct culverts	600	1150
1.2.11 Bus Shelters				
1.2.11	1390	Construct bus shelters	1360	1150
1.2.12 Bus Stops				
1.2.12.1	1180	Construct concrete curbs to laybys at bus stops	1290	1380
1.2.12.2	1290	Place subbase/base in bus stops	850,900,950,1000,1050,1100	1180,1380
1.2.12.3	1380	Place asphalt to bus laybys	1290	1410
1.2.12.4	1410	Erect signage to bus stops and tourist viewpoints	1380,1400	1450
1.2.13 Utilities				
1.2.13.1	1320	Relocate telecommunication infrastructure	600	1150
1.2.13.2	1340	Replace old infrastructure with new	600	1150
1.2.13.3	1350	Relocate power lines	600	1150
1.3 SUPERVISION AND PROJECT MANAGEMENT				
1.3.1 Supervision				
1.3.1.1	650	Supervise works	600	1450
1.3.1.2	600	Carry out kick off meeting	550,560	1100,1340,650,700,850,900,950,1000,1350,1050,1320,1310
1.3.1.3	1450	Issue taking over certificate	770,1410,650,1420,1440,1390,790,1400,800	1460
1.3.1.4	1460	Undertake supervision during defects liability period.	1450	1470,1500
1.3.2 Project management				
1.3.2	80	Project management	90	1510
1.4 PROJECT CLOSURE				
1.4.1	1500	Issue performance certificate	1460	1480,1490,1510

1.4.2	1480	Prepare final account for works contract	1500	1490,1510
1.4.3	1490	Prepare project closeout report	1500,1480	1510
1.4.4	1470	Prepare as built drawings	1460	1510
1.4.5	1510	Close project office	1470,1480,1490,1500	None

4.3.4 Estimate Activities Duration

The next step undertaken in the schedule management process was the “Estimate Activity Durations” process. This step involved estimating the amount of effort required for each activity and then calculating the total duration.

Estimate activity duration involves analysing different activities and estimates how long it takes to accomplish a certain task with the estimated amount of resources. The benefit of this particular process is that it provides the amount of time that each activity will require in order for it to be accomplished.

To make the estimate activity duration, the following inputs were used- schedule management plan, activity list, activity attributes, resource calendars, project scope statement, risk register, resource breakdown structure, enterprise environmental factors and the organizational process assets. All of these things were necessary to come up with a good estimate for each individual task involved in the project life cycle.

All estimates are to some extent uncertain at the beginning of a project and need to be progressively updated as a better idea of how efficiently work is being done and exactly what resources are available is determined. The time required to complete an activity was calculated in function of the resources assigned to it.

When assigning additional resources to an activity, always consider the possibility that it might reduce the overall efficiency and productivity. Most activities have a threshold beyond which assigning additional resources does not reduce the duration because of the additional overhead of communication and coordination.

The resource calendar, finalized (or modified) during activity resource estimating, contains the type, quantity, availability, and capability of each resource, including the skills of a human resource, which must be considered during activity duration

estimating. Capability and quantity of available resources, both human and material, can affect the activity duration estimate. Expert judgment using historical information from similar projects and analogous estimating was used to provide duration estimates.

This process also includes incorporating a time cushion into the schedule; this cushion is usually called a contingency reserve, time reserve, or time buffer. Its purpose is to accommodate the possibility of schedule risks. To calculate the contingency reserve a percentage of the original activity duration estimate of 5-10% was used in the absence of quantitative analysis methods. When more information about the project becomes available, the contingency reserve may be reduced.

The results of this exercise are given below in the Chart 28.

Chart 28. Activity Durations (Source: A. Jn. Baptiste, author, 2019)

WBS	Activity Code	Activity Name	Predecessors	Successors	Duration/days
1.1 PRE-CONSTRUCTION SERVICES					**180**
1.1.1 Procurement of Consultants					**70**
1.1.1.1	90	Commencement of procurement process for design review and supervision consultant	None	100	0
1.1.1.2	100	Procure consultants	90	150,200,250,300,350	70
1.1.1.3	120	Award of consultancy contract	100	150,200,250,300,350	0
1.1.2 Design and Cost Review					**40**
1.1.2.1	150	Undertake traffic studies review	100,120	350,400	10
1.1.2.2	200	Undertake topographic surveys review	100,120	350,400	10
1.1.2.3	250	Undertake geotechnical studies review	100,120	350,400	10
1.1.2.4	300	Undertake utility assessment	100,120	350,400	5
1.1.2.5	350	Undertake Engineering designs review	100,120,150,200,250,300	450	20
1.1.2.6	400	Consult the public	150,200,250,300	450	5
1.1.2.7	450	Undertake cost estimate review	350,400	500	5
1.1.2.8	500	Prepare bid documents	450	550	5
1.1.2.9	510	Completion of design services	500	515	0
1.1.3 Procurement of Works Contractor					**70**
1.1.3.1	515	Commencement of procurement process for works contractor	510	550	0
1.1.3.2	550	Procure works contractor	500,515	560,600	70
1.1.3.3	560	Award of works contract	550	600,650	0
1.2 CONSTRUCTION					**55**
1.2.1 Drainage					**15**
1.2.1.1	850	Dig earthen drains	600	1150,1280,1290	5
1.2.1.2	900	Construct lined drains	600	1150,1280,1290	15
1.2.1.3	950	Repair concrete drains	600	1150,1280,1290	10
1.2.2 Retaining Walls					**10**
1.2.2.1	1000	Construct retaining walls	600	1150,1280,1290	10

1.2.2.2	1050	Repair masonry retaining walls	600	1150,1280,1290	5
1.2.3 Slope stabilization					**10**
1.2.3	800	Build slope stabilization	600	1150,1280,1290	10
1.2.4 Roads					**30**
1.2.4.1	1100	Construct road widening including ancillary works	600,1350	1150	5
1.2.4.2	1150	Place road sub base in road widening	1300,1310,850,900,950,1000,1050,1100,1320,1340	1160	5
1.2.4.3	1160	Place road base in road box	1150	1360	10
1.2.4.4	1360	Construct asphalt overlay to roads	1160	1440,1430	5
1.2.5 New Culvert Construction					**10.25**
1.2.5.1	700	Construct culvert foundation	600	720	2
1.2.5.2	710	Construct culvert	720	780	3
1.2.5.3	720	Construct formwork	700	710	0.5
1.2.5.4	730	Construct catch basins	710	740	2
1.2.5.5	740	Excavation for rip rap protection	730	750	1
1.2.5.6	750	Preparation of excavated surfaces	740	760	0.5
1.2.5.7	760	Geotextile material to existing ground	750	770	0.25
1.2.5.8	770	Construct rip rap protection	760	1450	1
1.2.5.9	780	Construct asphalt overlay to culvert deck	710	790	0.25
1.2.5.10	790	Construct, install and paint railings to culvert	780	1450	3
1.2.6 Bus Lay Byes at Tourist Viewpoints					**7.25**
1.2.6.1	1170	Construct concrete curbs to laybys at tourist viewpoints	1280	1370	1
1.2.6.2	1280	Place subbase/base in laybys at tourist view points	850,900,950,1000,1050,1100	1370,1170	1
1.2.6.3	1370	Place asphalt to laybys at tourist viewpoints	1280,1170,1400	1390,1400,1410	0.25
1.2.6.4	1400	Construct Amenities	1370,1410,1450	1420,1430,1440	5
1.2.7 Traffic Safety Devices					**5**
1.2.7	1440	Install traffic safety devices	1360	1450	5
1.2.8 Road markings					**5**
1.2.8	1430	Place road markings	1360	1450	5
1.2.9 Vertical Road Signs					
1.2.9	1420	Erect vertical road signs	1360	1450	1

1.2.10 Culvert Repair and Clearing					**20**
1.2.10.1	1300	Repair culverts	600	1150	7
1.2.10.2	1310	Clear and desilt culverts	600	1150	5
1.2.11 Bus Shelters					**20**
1.2.11	1390	Construct bus shelters	1360	1150	20
1.2.12 Bus Stops					**14**
1.2.12.1	1180	Construct concrete curbs to laybys at bus stops	1290	1380	5
1.2.12.2	1290	Place subbase/base in bus stops	850,900,950,1000,1050,1100	1180,1380	5
1.2.12.3	1380	Place asphalt to bus laybys	1290	1410	2
1.2.12.4	1410	Erect signage to bus stops and tourist viewpoints	1380,1400	1450	2
1.2.13 Utilities					**10**
1.2.13.1	1320	Relocate telecommunication infrastructure	600	1150	5
1.2.13.2	1340	Relocate water infrastructure	600	1150	10
1.2.13.3	1350	Relocate power lines	600	1150	5
1.3 SUPERVISION					**316**
1.3.1 Supervision					**55**
1.3.1.1	650	Supervise works	600	1450	120
1.3.1.2	600	Carry out kick off meeting	550,560	1100,1340,650,700,850,900,950,1000,1350,1050,1320,1310	1
1.3.1.3	1450	Issue taking over certificate	770,1410,650,1420,1440,1390,790,1400,800	1460	0
1.3.1.4	1460	Undertake supervision during defects liability period.	1450	1470,1500	260
1.3.2 Project management					**516**
1.3.2	80	Project management	90	1510	516
1.4 PROJECT CLOSURE					**20**
1.4.1	1500	Issue performance certificate	1460	1480,1490,1510	0
1.4.2	1480	Prepare final account for works contract	1500	1490,1510	5
1.4.3	1490	Prepare project closeout report	1500,1480	1510	10
1.4.4	1470	Prepare as built drawings	1460	1510	10
1.4.5	1510	Close project office	1470,1480,1490,1500	None	5

4.3.5 Develop Schedule

The final planning process conducted for Project Time Management as detailed in the PMBOK® guide is the development of the schedule.

In project management, developing an efficient schedule is very important. A good schedule will let the stakeholders of the project to use their time wisely to deliver results. Moreover, it also ensures that the project life cycle will be able to meet the necessary deadline.

To develop the schedule, an analysis was undertaken of activity sequences, resource requirements, durations and schedule constraints. The advantage of this process is that by using different inputs and resources like schedule activities, duration, logical relationship and resource ability with the scheduling tool, it creates a schedule model with the planned dates for completing the project activities.

Different project management tools and techniques were used in developing the schedule and these include the schedule network analysis, critical path method, leads and lags, and the Microsoft Project 2016/2019 scheduling tool.

Having developed the schedule, different yet critically important outputs which include generation of schedule baseline, project schedule, schedule data, project calendars, project document updates and project management plan updates will result. All of these outputs are necessary for schedule plan management which is undertaken throughout the project life cycle.

The Milestone list for FAARP-II (Package 1) is given in the Chart 29 following.

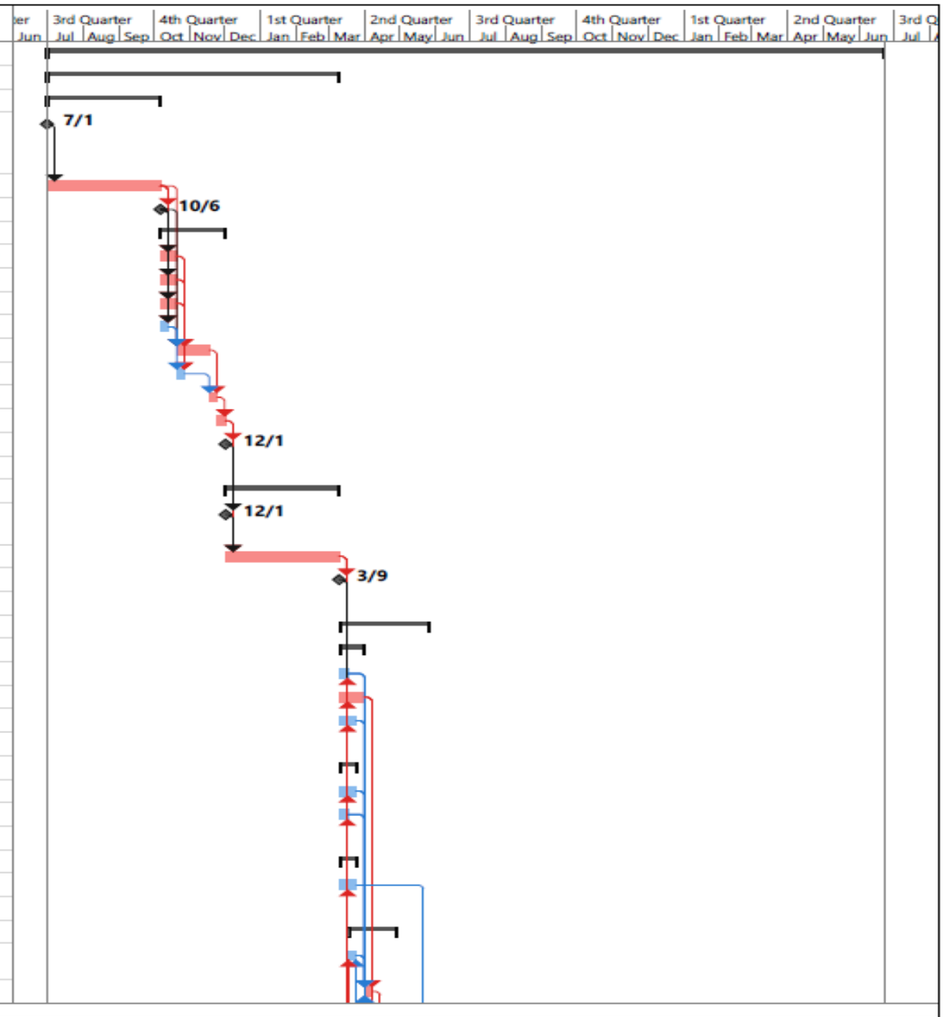
Chart 29. Milestone List for FAARP-II (Package 1) (Source: A. Jn. Baptiste, the author, 2019)

Milestone	Description	Date
1	Commencement of procurement process for Design Review and Supervision consultant	01/07/2020
2	Award of consultancy contract	06/10/20
3	Completion of design review services	01/12/20
4	Commencement of procurement process for Works Contractor	01/12/20
5	Award of works contract	09/03/21
6	Issuance of Taking Over certificate	26/05/21
7	Issuance of Performance Certificate	25/05/22
8	Project Closure	22/06/22

The project schedule is given below. Same will be updated once an approved schedule for the works is obtained from the contractor.

Chart 30. Project schedule for FAARP II Package 1 (Source: A. Jn Baptiste, Author, 2019)

ID	WBS	Activity Code	Task Name	Predecessors	Successors	Duration	Start	Finish
1	**1**		**Project Management**			**516 days**	**7/1/20**	**6/22/22**
2	**1.1**		**1.1 PRE-CONSTRUCTION SERVICES**			**180 days**	**7/1/20**	**3/9/21**
3	**1.1.1**		**1.1.1 Procurement of Consultants**			**70 days**	**7/1/20**	**10/6/20**
4	1.1.1.1	90	Commencement of procurement process for design review and supervision consultant		5	0 days	7/1/20	7/1/20
5	1.1.1.2	100	Procure consultants	4	8,9,10,11,12,6	70 days	7/1/20	10/6/20
6	1.1.1.3	120	Award of consultancy contract	5	8,9,10,11,12	0 days	10/6/20	10/6/20
7	**1.1.2**		**1.1.2 Design and Cost Review**			**40 days**	**10/7/20**	**12/1/20**
8	1.1.2.1	150	Undertake traffic studies review	5,6	13,12	10 days	10/7/20	10/20/20
9	1.1.2.2	200	Undertake topographic surveys review	5,6	12,13	10 days	10/7/20	10/20/20
10	1.1.2.3	250	Undertake geotechnical studies review	5,6	12,13	10 days	10/7/20	10/20/20
11	1.1.2.4	300	Undertake utility assessment	5,6	12,13	5 days	10/7/20	10/13/20
12	1.1.2.5	350	Undertake Engineering designs review	5,9,10,11,6,8	14	20 days	10/21/20	11/17/20
13	1.1.2.6	400	Consult stakeholders	8,9,10,11	14	5 days	10/21/20	10/27/20
14	1.1.2.7	450	Undertake cost estimate review	12,13	15	5 days	11/18/20	11/24/20
15	1.1.2.8	500	Prepare bid documents	14	16,20	5 days	11/25/20	12/1/20
16	1.1.2.9	510	Completion of design services	15	19	0 days	12/1/20	12/1/20
17								
18	**1.1.3**		**1.1.3 Procurement of Works Contractor**			**70 days**	**12/1/20**	**3/9/21**
19	1.1.3.1	515	Commencement of procurement process for works contractor	16	20	0 days	12/1/20	12/1/20
20	1.1.3.2	550	Procure works contractor	15,19	90,21	70 days	12/2/20	3/9/21
21	1.1.3.3	560	Award of Works Contract	20	90	**0 days**	3/9/21	3/9/21
22								
23	**1.2**		**1.2 CONSTRUCTION**			**55 days**	**3/11/21**	**5/26/21**
24	**1.2.1**		**1.2.1 Drainage**			**15 days**	**3/11/21**	**3/31/21**
25	1.2.1.1	850	Dig earthen drains	90	38,56,78	5 days	3/11/21	3/17/21
26	1.2.1.2	900	Construct lined drains	90	38,56,78	15 days	3/11/21	3/31/21
27	1.2.1.3	950	Repair concrete drains	90	38,56,78	10 days	3/11/21	3/24/21
28								
29	**1.2.2**		**1.2.2 Retaining Walls**			**10 days**	**3/11/21**	**3/24/21**
30	1.2.2.1	1000	Construct retaining walls	90	38,56,78	10 days	3/11/21	3/24/21
31	1.2.2.2	1050	Repair masonry retaining walls	90	38,56,78	5 days	3/11/21	3/17/21
32								
33	**1.2.3**		**1.2.3 Slope stabilization**			**10 days**	**3/11/21**	**3/24/21**
34	1.2.3	800	Build slope stabilization	90	91	10 days	3/11/21	3/24/21
35								
36	**1.2.4**		**1.2.4 Roads**			**30 days**	**3/18/21**	**4/28/21**
37	1.2.4.1	1100	Construct road widening including ancillary works	90,85	38,56,78	5 days	3/18/21	3/24/21
38	1.2.4.2	1150	Place road sub base	25,26,27,30,31,	39	5 days	4/1/21	4/7/21



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Task	Inactive Task	Manual Summary Rollup	External Milestone	Manual Progress	
Split	Inactive Milestone	Manual Summary	Deadline		
Milestone	Inactive Summary	Start-only	Critical		
Summary	Manual Task	Finish-only	Critical Split		
Project Summary	Duration-only	External Tasks	Progress		

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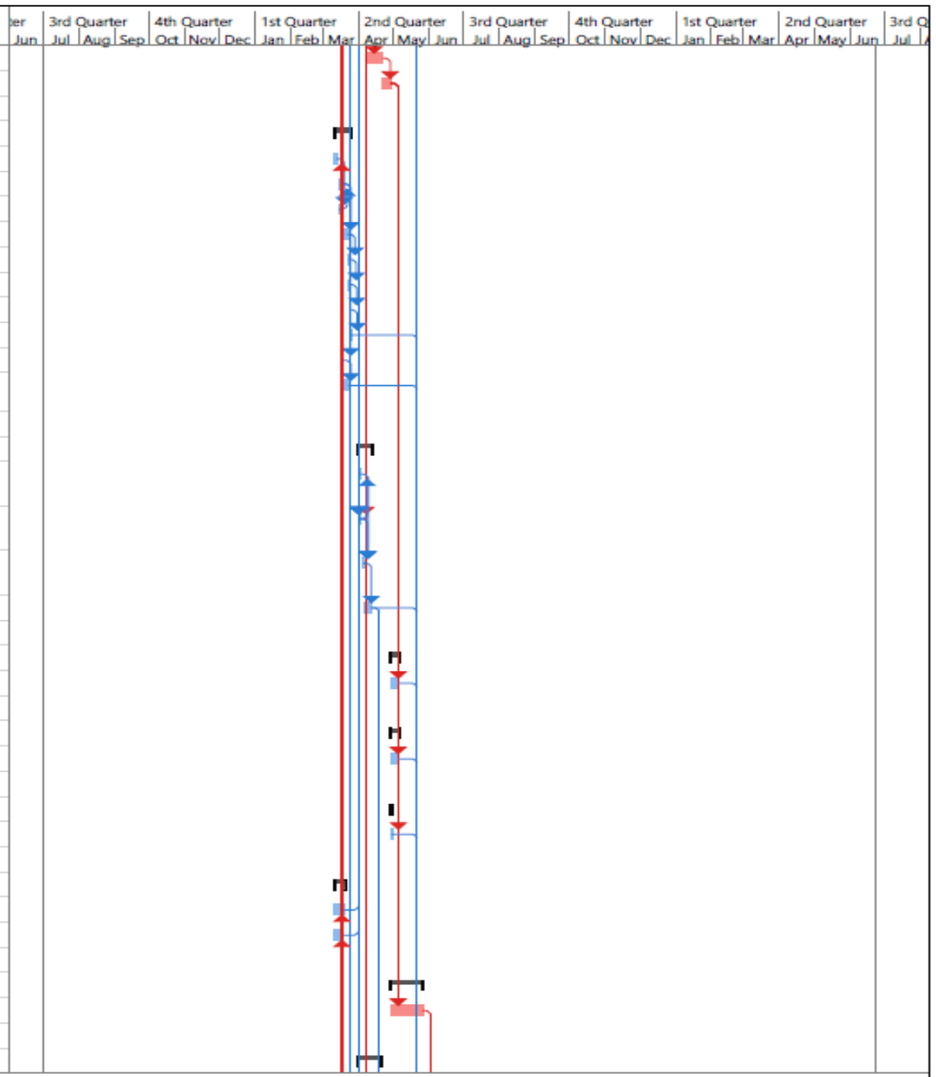
ID	WBS	Activity Code	Task Name	Predecessors	Successors	Duration	Start	Finish
39	1.2.4.3	1160	Place road base in road box	38	40	10 days	4/8/21	4/21/21
40	1.2.4.4	1360	Construct asphalt overlay to roads	39	61,64,67,74	5 days	4/22/21	4/28/21
41								
42	**1.2.5**		**1.2.5 New Culvert Construction**			**10.25 days**	**3/11/21**	**3/25/21**
43	1.2.5.1	700	Construct culvert foundation	90	45	2 days	3/11/21	3/12/21
44	1.2.5.2	710	Construct culvert	45	46,51	3 days	3/15/21	3/18/21
45	1.2.5.3	720	Construct formwork	43	44	0.5 days	3/15/21	3/15/21
46	1.2.5.4	730	Construct catch basins	44	47	2 days	3/18/21	3/22/21
47	1.2.5.5	740	Excavation for rip rap protection	46	48	1 day	3/22/21	3/23/21
48	1.2.5.6	750	Preparation of excavated surfaces	47	49	0.5 days	3/23/21	3/23/21
49	1.2.5.7	760	Geotextile material to existing ground	48	50	0.25 days	3/24/21	3/24/21
50	1.2.5.8	770	Construct rip rap protection	49	91	1 day	3/24/21	3/25/21
51	1.2.5.9	780	Construct asphalt overlay to culvert deck	44	52	0.25 days	3/18/21	3/18/21
52	1.2.5.10	790	Construct, install and paint railings to culvert	51	91	3 days	3/18/21	3/23/21
53								
54	**1.2.6**		**1.2.6 Bus Lay Byes at Tourist Viewpoints**			**7.25 days**	**4/1/21**	**4/12/21**
55	1.2.6.1	1170	Construct concrete curbs to laybys at tourist viewpoints	56	57	1 day	4/2/21	4/2/21
56	1.2.6.2	1280	Place subbase/base in laybys at tourist view points	25,26,27,30,31,	57,55	1 day	4/1/21	4/1/21
57	1.2.6.3	1370	Place asphalt to laybys at tourist viewpoints	56,55	58	0.25 days	4/5/21	4/5/21
58	1.2.6.4	1400	Construct Amenities	57	91,80	5 days	4/5/21	4/12/21
59								
60	**1.2.7**		**1.2.7 Traffic Safety Devices**			**5 days**	**4/29/21**	**5/5/21**
61	1.2.7	1440	Install traffic safety devices	40	91	5 days	4/29/21	5/5/21
62								
63	**1.2.8**		**1.2.8 Road markings**			**5 days**	**4/29/21**	**5/5/21**
64	1.2.8	1430	Place road markings	40	91	5 days	4/29/21	5/5/21
65								
66	**1.2.9**		**1.2.9 Vertical Road Signs**			**1 day**	**4/29/21**	**4/29/21**
67	1.2.9	1420	Erect vertical road signs	40	91	1 day	4/29/21	4/29/21
68								
69	**1.2.10**		**1.2.10 Culvert Repair and Clearing**			**7 days**	**3/11/21**	**3/19/21**
70	1.2.10.1	1300	Repair culverts	90	38	7 days	3/11/21	3/19/21
71	1.2.10.2	1310	Clear and desilt culverts	90	38	5 days	3/11/21	3/17/21
72								
73	**1.2.11**		**1.2.11 Bus Shelters**			**20 days**	**4/29/21**	**5/26/21**
74	1.2.11	1390	Construction of bus shelters	40	91	20 days	4/29/21	5/26/21
75								
76	**1.2.12**		**1.2.12 Bus Stops**			**14 days**	**4/1/21**	**4/20/21**



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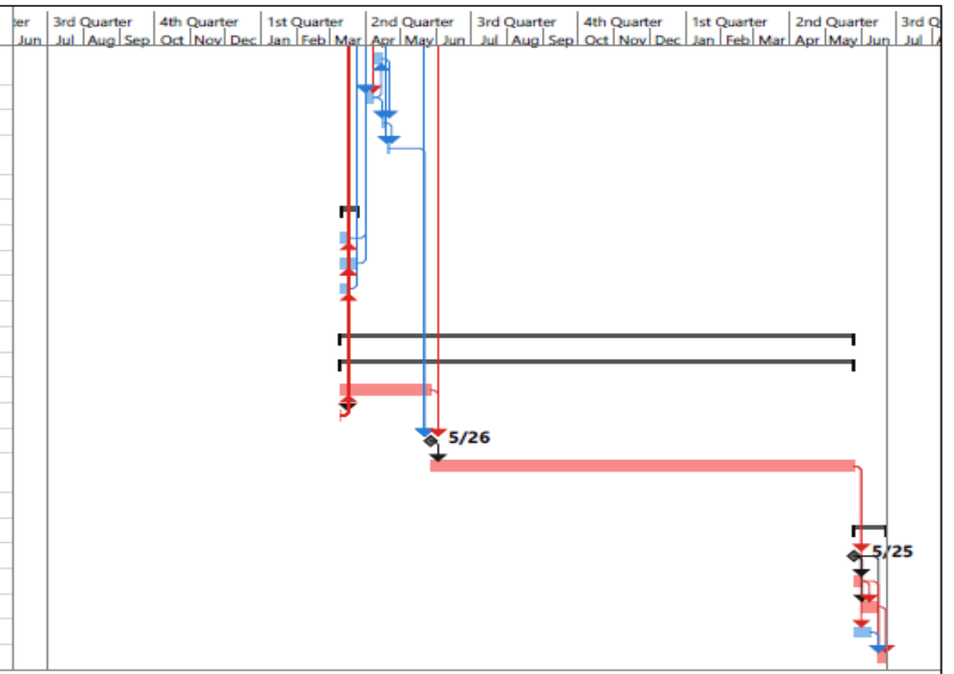
Project Summary	Duration-only	External Tasks	Progress	

ID	WBS	Activity Code	Task Name	Predecessors	Successors	Duration	Start	Finish
77	1.2.12.1	1180	Construct concrete curbs to laybys at bus stops	78	79	5 days	4/8/21	4/14/21
78	1.2.12.2	1290	Place subbase/base in bus stops	25,26,27,30,31,	77,79	5 days	4/1/21	4/7/21
79	1.2.12.3	1380	Place asphalt to bus laybys	78,77	80	2 days	4/15/21	4/16/21
80	1.2.12.4	1410	Erect signage to bus stops and tourist viewpoints	79,58	91	2 days	4/19/21	4/20/21
81								
82	**1.2.13**		**1.2.13 Utilities**			**10 days**	**3/11/21**	**3/24/21**
83	1.2.13.1	1320	Relocate telecommunication infrastructure	90	38	5 days	3/11/21	3/17/21
84	1.2.13.2	1340	Relocate water infrastructure	90	38	10 days	3/11/21	3/24/21
85	1.2.13.3	1350	Relocate power lines	90	37	5 days	3/11/21	3/17/21
86								
87	**1.3**		**1.3 SUPERVISION**			**316 days**	**3/10/21**	**5/25/22**
88	**1.3.1**		**1.3.1 Supervision**			**316 days**	**3/10/21**	**5/25/22**
89	1.3.1.1	650	Supervise works	90	91	55 days	3/11/21	5/26/21
90	1.3.1.2	600	Carry out kick off meeting	20,21	89,25,26,27,30,	1 day	3/10/21	3/10/21
91	1.3.1.3	1450	Issue taking over certificate	61,64,67,34,52,	92	0 days	5/26/21	5/26/21
92	1.3.1.4	1460	Undertake supervision during defects liability period.	91	95,98	260 days	5/27/21	5/25/22
93								
94	**1.4**		**1.4 PROJECT CLOSURE**			**20 days**	**5/25/22**	**6/22/22**
95	1.4.1	1500	Issue performance certificate	92	96,97,99	0 days	5/25/22	5/25/22
96	1.4.2	1480	Prepare final account for works contract	95	97,99	5 days	5/26/22	6/1/22
97	1.4.3	1490	Prepare project closeout report	96,95	99	10 days	6/2/22	6/15/22
98	1.4.4	1470	Prepare as built drawings	92	99	10 days	5/26/22	6/8/22
99	1.4.5	1510	Close project office	97,96,95,98		5 days	6/16/22	6/22/22



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Task	Inactive Task	Manual Summary Rollup	External Milestone	Manual Progress
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4.4 Cost Management Plan

4.4.1 Process Description and importance

Cost is usually one of the first questions that come up at the beginning of a project and it is usually answered by a cost management plan. A cost management plan is an outline of a project's estimation, allocation and control for the required resources to complete all project activities. It is one of the most important part of the project planning phase as it ensures the cost of the project stays within its budget limits. The key benefit of this plan is that is provides guidance and direction as to how the project's cost will be managed throughout the lifecycle of the project. This process starts early in the project planning phase and can be performed once or at predefined point within the project.

The cost management plan produces an approved budget, monitors cost throughout the project and provides a basis for decision to unexpected and extra cost that may arise throughout the project's lifecycle. This plan also establishes units of measurements for each resource such as staff hours, meters, litres or cubic meters for quantity measure. It also established a level of precision and accuracy, organizational procedures links, rules of performance measurements, reporting formats and additional information such as descriptions of strategic fund choices, how to account for fluctuation in currency exchange and procedures for cost recording. (PMI, 2017)

4.4.2 Main Stakeholders Involved

The main stakeholders involved in the Cost Management Plan for FAARPII are:

1. Department of Infrastructure, Ports and Energy – Permanent Secretary
2. Department of Infrastructure, Ports and Energy – Chief Engineer
3. Design Consultants
4. Financier-Design and Implementation phase.
5. Ministry of Finance – Director of Finance
6. Ministry of Economic Development – Chief Economist

4.4.3 Tools and techniques used in the cost management plan

According to PMBOK® 6th ed., two (2) tools and techniques were used in developing the cost management plan. They are as follows:

1. *Expert Judgement* – this tool seeks the expertise of individuals or groups who would have dealt with similar projects, the industry, discipline and application area, cost estimates and budgets and earned value management to better guide and aid in the decision making and development of the cost management plan.

2. *Meetings* – this tool is used to assist the project team in developing the cost management plan. Meetings can be scheduled with the project manager, sponsors, team members, stakeholders and all relevant persons required for or necessary for providing project cost and estimations.

4.4.4 Duration Estimates.

According to PMBOK® 6th ed., during the Estimate Activity Duration process the project manager and team will estimate the number of work periods needed to complete individual activities with the estimated resources.

During this exercise, the project manager defined the number of days needed to complete the activities with the resources allocated. In order to complete this process, several important project documents were used as input, for example the assumption and constraints, the activity list, the milestone list, the resource calendar and requirements, etc.

One of the major benefits of developing this estimation is that it provides the time each activity will take to be completed and therefore the estimate to finish date of the project. In determining the duration estimates, an estimation of the quantity of work effort required to complete the activity and the quantity of available resources estimated to complete the activity were used. These were then used to estimate

the amount of work periods necessary for activity completion using appropriate project resources and calendar (PMBOK® 6th ed.). Estimate Activity Duration is a very critical and important phase of project management for the FAARP-II and its outputs “Duration Estimates” and “Basis of Estimates” are necessary inputs for developing the project budget.

Chart 31. Activity list chart including: coding, activity name, milestones, brief activity description, predecessors/successors list, required resources per activity Source: A. Jn. Baptiste, the author, 2019)

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
1.1.1.2	100	Procure consultants	Procurement of consultants according to the Caribbean Development Bank's procurement guidelines and the Finance Act of Saint Lucia	None	150,200,250,300, 350	70	Project Manager
1.1.2.1	150	Undertake traffic studies	Carry out traffic studies to inform the pavement design for a design life of 20 years.	100,120	350,400	10	Traffic Engineer,10 automatic counters,4 technicians.
1.1.2.2	200	Undertake topographic surveys	Carry out topographic studies to locate the road corridor, to set out the road widening, laybys and locate drains and retaining structures.	100,120	350,400	10	1 Engineering surveyor,2 survey technicians
1.1.2.3	250	Undertake geotechnical studies	Carry out geotechnical investigations to compile the materials report which will inform the structural design review of the road pavement and retaining structures.	100,120	350,400	10	Materials engineer,1 technicians
1.1.2.4	300	Undertake utility assessment	Carry out a Utility	100,120	350,400	5	1 utilities engineer,2

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
			assessment to inform replacement of old water lines, and the relocation of electricity poles and telecommunication infrastructure.				technicians,1 pickup truck.
1.1.2.5	350	Undertake Engineering designs review	Carry out the design for drainage structures, a new bridge, retaining walls, slope stabilization bus stops and laybys and road pavement structure.	100,120,150,200,250,300,350	450	20	1 team leader,1 design engineer,1 CAD technician
1.1.2.6	400	Consult the public	Engage the affected public along the road corridor on the proposed project with a view to addressing all concerns.	150,200,250,300	450	5	Project manager, Consultant's team leader.
1.1.2.7	450	Undertake cost estimate review	Carry out the necessary analysis to inform the total cost of the works to facilitate the bidding exercise.	350,400	500	5	Quantity Surveyor,2 quantity surveying technicians.
1.1.2.8	500	Prepare bid documents	Undertake the necessary to prepare the required documentation to facilitate	450	550	5	Team leader.

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
			the submission of full proposals by interested contractors.				
1.1.3.2	550	Procure works contractor	Procurement of contractors for the works according to the Caribbean Development Bank's procurement guidelines and the Finance Act of Saint Lucia	500,515	560, 600	70	Project manager.
1.3.1.2	600	Carry out kick off meeting	Organize and hold a meeting with the selected contractor and the sponsor prior to the commencement of works to ensure clarity in respect of protocols.	550,560	1100,1340,650,700,850,900,950 100,1350,1050,1320,1310	1	Project manager, Team leader.
1.3.1.1	650	Supervise works	Undertake the supervision of all works according to the consultancy agreement between the sponsor and the consultant.	600	1450	55	Resident Engineer,4 Technicians
1.2.5.1	700	Construct culvert foundation	Undertake the necessary to build the culvert foundation according to the design drawings.	600	720	2	Backhoe, Operator for Backhoe, Tipper Truck, 1 Labourer, 2 Masons, Supervisor, Concrete

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
							(C35/20) , Reinforcement ,Formwork, 1 Concrete Batching Plant
1.2.5.2	710	Construct Culvert	Undertake the necessary procedures to construct new culvert.	720	730,780	3	Formwork , Reinforcement , Concrete(C35/20), 2 Labourers, 2 Masons, Supervisor,900 mm diameter concrete pipe culverts.
1.2.5.3	720	Construct formwork to culvert	Undertake the necessary to construct formwork for culvert pipe installation.	700	710	0.5	Carpenter, Foreman,1 labourer, timber
1.2.5.4	730	Construct catch basin to new culvert	Undertake the necessary to construct the catch basin to the new culvert.	710	740	2	Formwork, Reinforcement , Concrete(C35/20), 2 Labourers, 1 Mason, Supervisor.
1.2.5.5	740	Excavate for rip rap protection.	Undertake the necessary to facilitate placement of rip rap as per design drawings.	730	750	1	1 Backhoe,1 supervisor, 1 labourer
1.2.5.6	750	Prepare excavated surfaces	Undertake the necessary to prepare excavation for rip rap as per design drawings	740	760	0.5	2 Labourers, Supervisor
1.2.5.7	760	Place geotextile material on	Undertake the necessary to adequately place geogrid	750	770	0.25	2 Labourers, Supervisor,

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
		existing ground	to receive rip rap as per design drawings.				Geotextile
1.2.5.8	770	Construct rip rap protection.	Undertake the necessary to construct the bridge joints according to the design drawings.	760	1450	1	Supervisor,2 labourers, excavated boulders
1.2.5.9	780	Construct asphalt overlay to culvert deck.	Undertake the necessary to overlay the culvert deck with 75 mm asphaltic concrete according to designs.	710	790	0.25	Asphalt-75mm, Asphalt Paver, Asphalt Paver Operator, Roller, 2 Labourers, Foreman
1.2.5.10	790	Construct, install and paint railings to culvert	Undertake the installation and painting of culvert railings to design.	780	1450	3	RHS, Welder, paint, painter, labourer, supervisor
1.2.3	800	Build slope stabilization	Implement slope stabilization mechanisms as per design over discrete sections of road.	600	1150,1280,1290	10	Supervisor,50 M^2 ,type A geogrid,50 plants of vertivert grass,2 Labourers, Tipper truck, driver.
1.2.1.1	850	Dig earthen drains	Dig earthen drains as per designs over 803m of road.	600	1150,1280,1290	5	Back hoe-1 No, Tipper Trucks-1, Operators-1, Supervisor ,laborers-4.,1 driver.
1.2.1.2	900	Construct lined drains	Construct a total length of 274 m of concrete drains of various sections as per	600	1150,1280,1290	15	Concrete, Formwork, Reinforcement, 6 Labourers, Supervisor,

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
			design.				Masons-3, 1 Tipper truck and driver.
1.2.1.3	950	Repair concrete drains	Repair 803 m of concrete drains of various cross sections as per design.	600	1150,1280,1290	10	Concrete, Reinforcement, 4 Labourers, Supervisor , Formwork, Masons-2, Tipper truck and driver
1.2.2.1	1000	Construct retaining wall	Construct retaining wall as per design.	600	1150,1280,1290	10	Rubble, Concrete, Reinforcement, Tipper Truck, Driver for Vehicle, 4 Labourers, Supervisor, Masons -3
1.2.2.2	1050	Repair masonry retaining walls	Repair retaining walls as per design at identified locations along the road corridor.	600	1150, 1280,1290	5	1 Mason, Concrete , Rubble, 1 Labourer, Supervisor
1.2.4.1	1100	Construct road widening including ancillary works	Undertake road widening as informed by the new horizontal road alignment along with ancillary works to receive subbase and base.	600,1350	1410,1450	10	Backhoe, 2 Tipper Trucks, , 4 Labourers, Supervisor
1.2.4.2	1150	Place road sub base in road widening	Undertake construction of road sub base as per new pavement design over road widening.	1300, 1310,850,400,450,1000, 1050,1100,1320,1340	1160	5	2400 M^2 Crusher Run-100mm, 2 Rollers, Operators , 4 Tipper Trucks, Supervisor , Drivers, 6

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
							Labourers
1.2.6.2	1280	Place subbase/base in laybys at tourist viewpoints-1 No.	Undertake construction of road sub base/base as per new pavement design in laybys at tourist viewpoints.	850,900,950,1000,1050, 1100	1170,1370	1	25 M^2 Crusher run-200, Supervisor, Roller, Operator, 2 Labourers
1.2.12.2	1290	Place subbase/base in bus stops-10 No.	Undertake construction of road sub base/base as per new pavement design in laybys at bus stops.	850,900,950,1000,1050, 1100	1180,1380	5	230 M^2 Crusher run-200mm, Supervisor , Roller, Operator, 2 Labourers
1.2.10.1	1300	Repair culverts	Undertake the repair of 7 culverts as per design.	600	1150	7	Concrete, Reinforcement, Formwork, 2 Labourers, 2 masons, Supervisor, concrete culvert pipes
1.2.10.2	1310	Clean and desilt culverts	Undertake the clearing of 7 culverts at various locations as per design.	600	1150	5	4 Labourers, Tipper Truck, Driver
1.2.13.1	1320	Relocate telecommunication infrastructure	Undertake the relocation of telecommunication infrastructure at predetermined locations as per design.	600	1150	5	Telecommunications technician 1, Telecommunications Subcontractor.
1.2.13.2	1340	Replace old water infrastructure with new	Undertake the replacement of aged water infrastructure at predetermined locations as	600	1150	10	WASCO Technician, WASCO Subcontractor

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
			per design.				
1.2.13.3	1350	Relocate power lines	Undertake the relocation of power lines at predetermined locations as per design.	600	1100	5	Power company's technician, Power Company subcontractor.
1.2.4.3	1160	Place road base in road box	Undertake construction of road base as per new pavement design over 1.12 km of road..	1150	1360	10	Crusher run base-100mm , 2 Tipper Trucks, 4 Labourers, Supervisor, 1 Grader,1 Roller, Operators
1.2.6.1	1170	Construct concrete curbs to layby at tourist viewpoint	Construct concrete curbs to 1 laybys at tourist viewpoint as per design.	1280	1370	1	Concrete , Concrete truck, Reinforcement ,Formwork, 1 Labourer, Supervisor,1 mason.
1.2.12.1	1180	Construct concrete curbs to laybys at bus stops	Construct concrete curbs to 10 laybys at bus stops as per design	1290	1380	5	Concrete , Concrete truck, Reinforcement, Formwork, 4 Labourers, Supervisor,2 masons.
1.2.4.4	1360	Construct asphalt overlay to roads	Construct asphaltic concrete overlay to 1.12 km of road as per design.	1160	1440,1400	5	Asphal-75mm, Asphalt Pavers-1, 6 Labourers , Supervisor ,Rollers-2,Sweeper,Technician
1.2.6.3	1370	Place asphalt to laybys at tourist viewpoints	Place 75 mm asphaltic concrete over 1 layby at tourist viewpoint.	1280,1170,1400	1390,1400,1410	0.25	Asphal-75mm, Asphalt Pavers-1, 2 Labourers , Supervisor ,Roller-

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
							1,Sweeper,Technician
1.2.12.3	1380	Place asphalt to bus laybys	Place 75 mm asphaltic concrete over 10 bus laybys	1180,1290	1410	1	Asphal-75mm, Asphalt Pavers-1, 2 Labourers , Supervisor ,Roller-1,Sweeper,Technician
1.2.11	1390	Construction of bus shelters	Undertake construction of 10 bus shelters as per architectural design	1360	1150	20	10 prefab structures.2 carpenters,2 masons,2 technicians,1 small crane,operator,1 tipper truck.
1.2.6.4	1400	Construct Amenities	Undertake construction of amenities to touristic viewpoint as per design.	1370,1410,1450	1420,1430,1450	10	1 prefab structure,2 carpenters,2 masons,1 technician,1 small crane,operator,1 tipper truck.
1.2.12.4	1410	Erect signage to bus stops and tourist viewpoints	Undertake the placing of bus stops and tourist viewpoint signage as per signage schedule.	1380,1400	1450	2	11 Traffic Signs, 11 Poles, Concrete , 2 Labourers, Supervisor,1 tipper truck
1.2.9	1420	Erect vertical road signs	Undertake the placing of vertical road signs as per signs schedule.	1360	1450	1	6 Traffic Signs, 6 Poles, Concrete , 2 Labourers, Supervisor,1 tipper truck.
1.2.8	1430	Place road markings	Undertake the painting of road markings as per the	1360	1450	5	Thermoplastic paint, Road Marking Machine, Machine Operators, Supervisor,

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
			road marking schedule.				Tipper truck
1.2.7	1440	Install traffic safety devices	Undertake the installation of traffic safety devices along the road as per designs.	1360	1450	5	100 M Guardrails, Concrete, Labourers-4, Supervisor, Tipper truck.
1.3.1.3	1450	Issue taking over certificate	Prepare and issue the taking over certificate on substantial completion of the works.	1400,800,1390,790,650, 770,1410,1420,1440	1400,1460	0	Resident Engineer
1.3.1.4	1460	Undertake supervision during defects liability period.	Undertake the supervision of all works during defects liability period, according to the consultancy agreement between the sponsor and the consultant.	1450	1470,1500	260	Resident Engineer
1.4.2	1480	Prepare final account for works contract	Undertake preparation of final account for the contracted work.	1500	1490,1510	5	Quantity Surveyor, Chief Resident Engineer
1.4.3	1490	Prepare project closeout report	Compile the project closeout report for project sponsor.	1480,1500	1510	10	Resident Engineer
1.4.4	1500	Issue performance certificate	Prepare and the issue the performance certificate on the fulfilment by the contractor of his	1460	1480,1490,1510	0	Resident Engineer

WBS	Activity Code	Activity Name	Activity Description	Predecessors	Successors	Duration/ Work days	Resource
			obligations at the end of the defects liability period.				
1.4.1	1470	Prepare as built drawings	Compile and submit to the sponsor a complete pictorial representation via design drawings of all the completed works.	1460	1510	10	AutoCAD Technician, Resident Engineer
1.4.5	1510	Close project office	Carry out the closing procedures for the project office.	1470,1480,1490,1500	None	5	Contractor , Resident Engineer

4.4.5 Activity Cost Estimates

4.4.5.1 Process Description and Importance

According to Project Management Skills, the budget for a project is simply the combined costs of the individual activities or work packages that the project must accomplish. The budget is represented by the approved cost baseline. There are two key reasons why the budget for the project is important.

First, the approved budget is what drives project funding. It tells the project stakeholders how much money is needed and when it is needed. The ability to get people, equipment, and materials when they are needed are dependent on the funding provided as a result of the budget.

The second reason budgeting is important for the project is because it provides the basis for project cost control. By measuring the project's actual cost against the approved budget, the Project Manager can determine if the project is progressing according to the plan or if corrective action is needed. This is accomplished using a cost baseline.

Six pieces of information were required to prepare the budget for FAARPII:

- Activity Cost Estimates
- Basis of Estimates
- Scope Baseline
- Project Schedule
- Resource Calendars
- Contracts

4.4.5.2 Estimating costs

The total construction cost was estimated during the design phase of FAARPII with the assistance of the design consultants. However due to the number of years which have elapsed and the requirements of the Funding Agency, revision of this cost estimate was required. Going forward, the Project Manager using this information and various tools and techniques previously identified has developed the cost baseline for the project. The full project budget was developed by the Project Manager using the construction cost and other cost necessary for the successful implementation of the project. It is understood that the construction cost will be revised once the review consultant is in place. The project manager has the responsibility for reviewing the project budget during the life of the project to determine if the assumptions and the original estimates are still valid.

4.4.5.3 Estimation techniques

Although there are various techniques to estimate project costs, those used for developing the full project budget were:

• **Analogous estimation**: It involved using historical values of completed projects.

• **Rate determination:** It involved using the rates of unit costs, such as personnel per hour, services and materials per unit, that correspond to each resource in an attempt to estimate the cost of an activity. A method to achieve this was by requesting quotes that allow for rates to be obtained. To establish the cost of products, services, or other results that should be rendered by contract, standard rates used by the DIPE, commercial databases, and price lists published by vendors was also included.

• **Estimation based on indices**: It involved using indices that determine the unit cost of a good or service in relation to the materials, the equipment and the personnel that are required to complete a unit of work. The unit cost was multiplied by the instances of the work unit in the project in order to determine the total cost.

These techniques for cost estimation were performed using a bottom-up approach. The bottom-up approach, starts at the level of the activity. For this approach, the project was divided into activities, and the required effort was calculated in order to complete each of these activities; then the costs were totalled until reaching a total budget. The bottom-up estimation took into consideration each activity forming the WBS.

4.4.5.4 Contingencies

The greater the amount of uncertainty of estimating project costs, the greater the need to have contingencies or reserves. This will help avoid unpleasant surprises when the project is in the implementation phase and an estimated cost is discovered to be well under the actual cost. The amount of the budget assigned to contingencies can vary according to the method used, such as the statistical analyses or information based on experience from similar projects. Reserves for contingencies should only be used for changes that were not planned for in the scope and the cost of the project. It is considered best practice for the project manager to obtain approval before using this reserve. For FAARPII a contingency reserve of 10% was used.

4.4.5.5 Activity Cost Estimates for Each Activity and Basis

A bottom up approach was used to arrive at the base cost for the project.

For the bottom-up approach we started at the level of the activity. For this approach we divided the project into activities using the WBS, and the required effort was calculated in order to complete each of these activities; then the costs were totalled until reaching a total budget.

The cost for each activity was done using unit rates developed for such work by the Quantity Surveying Unit of the Department of Infrastructure, Port Services and Energy for Civil Engineering Work. Details of the rates used follow in Chart 32. It must be appreciated that these unit rates cover materials, labour, plant, equipment, overheads and profits.

To calculate the base cost, the cost of design review, supervision, project management and general items for the construction phase were added to the activity costs. Design review costs, supervision costs, project management costs were determined via analogous estimating-the use of historical data from similar road projects. The General Item costs were calculated on a pro rate basis using the activity costs.

4.4.5.6 Assumptions:

1. The project base cost stand at $2,075,263.83
2. Contingency reserves stand at 10%
3. Management reserves stand at 3%-To be funded by the Government through the consolidated fund. This reserve can only be activated by the Minister of Finance upon the approval of Parliament.

Chart 32. Rate List (Source: The Author, A. Jn. Baptiste/DIPE Rate List, 2019)

Activity Code	ITEM	Rate (EC$)	Remarks
100	Project Manager	400.00/day	
150	Traffic Engineer	1,000.00/day	
	Traffic Counters	500.00 Each	
	Traffic Count Survey Technician	125.00/day	
200	Engineering Surveyors	750.00/day	
	Survey Technician	175.00/day	
250	Materials Engineer	650.00/day	
	Technician (Materials Investigation)	125.00/day	
300	Utilities Engineer	550.00/day	
	Technician (Utilities)	125.00/day	
350	Team leader (Designs)	1,250.00/day	
	Design Engineer	1,000.00/day	
	CAD Technician	175.00/day	
400	Project Manager	400.00/day	
	Team Leader	1,250.00/day	
450	Quantity Surveyor	550.00/day	
	Quantity Surveying	125.00/day	

Activity Code	ITEM	Rate (EC$)	Remarks
	Team		
500	Team Leader	1,250.00/day	
550	Project Manager	400.00/day	
600	Project Manager	400.00/day	
	Team Leader	1,250.00/day	
650	Resident Engineer	800.00/day	(LOE)
	QS	550.00/day	(LOE)
	Technician	125/day	(LOE)
700	Concrete	758.00/m^3	Rate is all inclusive
	Formwork	60.00/m^3	
	Steel	7,200/ton	
710	Concrete	758.00/m^3	Rate is all inclusive
	Formwork	60.00/m^2	
	Steel	7,200/ton	
	Concrete pipe culverts	1200/m	
720	Formwork	60.00/m^2	Rate is all inclusive
730	Concrete	758.00/m^3	Rate is all inclusive
	Formwork	60.00/m^2	
	Steel	7,200/ton	
740	Excavate for rip rap	55/m^3	Rate is all inclusive
760	Geotextile	45/m^2	Rate is all inclusive
770	Rip rap protection	250/m^3	Rate is all inclusive
780	Asphaltic Concrete – 75mm	120.49/m^2	Rate is all inclusive
790	Railings	2286.25/m	Rate is all inclusive
800	Geogrid	45.00/m^2	Rate is all inclusive
	Vetiver	10.00/plant	
850	Re dig Earthen Drains	275/m	Rate is all inclusive
900	Concrete	758.00/m^2	Rate is all inclusive
	Steel	7200.00/ton	
	Formwork	60.00/m^2	
950	Concrete	758.00/m^2	Rate is all inclusive
	Steel	7,200.00/ton	
	Formwork	60.00/m^2	
1000	Rubble	450/m^3	Rate is all inclusive
	Concrete	757.72/m^3	
	Reinforcement	7,200.00/ton	
1050	Concrete	757.72/m^3	Rate is all inclusive
	Rubble	450/m^3	
1100	Excavation for widening	51.43/m^3	Rate is all inclusive
1150	Crusher Run-100mm	42.00/m^2	Rate is all inclusive

Activity Code	ITEM	Rate (EC$)	Remarks
1280	Crusher Run-200mm	84.00/m^2	Rate is all inclusive
1290	Crusher Run -200mm	84.00/m^2	Rate is all inclusive
1300	Concrete	757.72/m^3	Rate is all inclusive
	Reinforcement	7,200.00/ton	
	Formwork	60.00/m^2	
1310	Cleaning and desilting culverts	1000.00/each	Rate is all inclusive
1320	Relocate Telecom Services	50,000.00(sum)	Based on quote from Telecommunications Authority
1340	Replace Old Water Infrastructure	75,000.00(sum)	Based on preliminary quote from Water Authority
1350	Relocate Power Lines	20,000.00(sum)	Based on preliminary quote from Power Company
1160	Crusher run-100mm	42.00/m^2	Rate is all inclusive
1170	Concrete	757.72/m^3	Rate is all inclusive
	Steel	7,200.00/ton	
	Formwork	60.00/m^2	
1180	Concrete	757.72/m^3	Rate is all inclusive
	Steel	7200.00/ton	
	Formwork	60.00/m^2	
1360	Asphalt -50mm	100.00/m^2	Rate is all inclusive
1370	Asphalt -75mm	120.00/m^2	Rate is all inclusive
1380	Asphalt-75mm	120.00/m^2	Rate is all inclusive
1390	Prefabricated Structure	20,500.00/Unit	Includes for supply and erection
1400	Prefabricated Structure	25,500.00/Unit	Includes for supply and erection
1410	Signs (Bus stops +Tourist view points)	520.00/each	Includes for supply and erection
1420	Traffic Signs	520.00/each	Includes for supply and erection
1430	Road Marking	22.50/m	54km of road marking
1440	Guardrails	250.00/m	500m of guard rails
1450	Resident Engineer	800.00/day	
1460	Resident Engineer	800.00/day	
1480	Resident Engineer	800.00/day	

Activity Code	ITEM	Rate (EC$)	Remarks
	QS	550.00/day	
1490	Resident Engineer	800.00/day	
1500	Resident Engineer	800.00/day	
1470	CAD Tec.	175.00/day	
1510	Resident Engineer	800.00/day	

Project Management Cost Breakdown	
Item	Unit Rate Cost /Day
Project Manager	$400.00 /day
Project Engineer	$250.00/day
Project Secretary	$175.00/day
Transport	$250.00/day
Miscellaneous Expenses (Electricity, Communication, Rentals etc.)	$250.00/day
Total	$1325.00/day

Work Supervision Cost	
Item	Anticipated Consultancy fees for Supervision Cost/Day
Resident Engineer	$800.00/day
Quantity Surveyor	$550.00/day
Technicians (4)	$600.00/day
Project Secretary	$175.00
Reimbursable	$325.00
Total	$2450.00/day

4.4.6 Project Budget

4.4.6.1 Process Description and Importance

Project Budget is an outline of the time-phased distribution of funds for the work/activities planned in a project. It pulls together all the estimated cost of these individual activities or work packages to generate an approved cost baseline. It helps determine what the scope items should be included or removed in the Project Management Plan as well as the degree of schedule crashing permitted so that the project can be delivered on-time.

The initial steps of project planning involve conducting the project budgeting process, and it is typically performed in parallel with the project scheduling process. The project budgeting process steps are highly dependent upon the cost estimations, task durations and allocated resources. The Work Breakdown Structure (WBS) of the project, the costs estimates, historical data and records, resource information, and policies all are utilized in order to identify the monetary resources required for the project.

As part of the project budgeting process for FAARPII, risk assessment and assignment have been applied to accommodate for things such as uncertainties and threats, team experience, reliability of the technology used, time shortages, availability of project resources, etc. that can happen during the project and affect the project's bottom line. The Contingency Reserves within the project budget were allocated to fund such fall back / contingency plans, or address any residual risk. It was calculated as 10 % percent of the estimated activity duration and work costs. The Management Reserve was allocated to fund unforeseen work and is an estimated 3% percentage of the budgeted cost.

Generally, a project budget uses the cost baseline which represents the total budget and any reserves, estimated costs of work, other budgets e.g. distributed and planning, and work/planning packages which are added to this original budget

plus the manage reserves. This is important because for FAARPII this serves as a communication tool to stakeholders to let them know what the total funds needed for the project are, where the funds would be allocated and why the reserves. It also allows for authorization and allocation of the monetary resources necessary to complete all project activities and deliver the project on schedule. Since the funding for FAARPII is to be allocated in stages, this allows the project manager to request what funds are required for certain stages. In addition, it provides the basis for project cost control where actual baseline cost can be measured against the approved budget, to determine if the project is progressing according to the plan or if corrective action is needed.

4.4.6.2 Reserve analysis including justification

As projects are built upon assumptions and constraints, it is necessary to include contingency reserves in the duration and budget estimates. This will mean that a certain percentage will be calculated to have a reserve related to budget or time. In order to calculate this reserve for the FAARPII-Package 1, the project manager has taken into account the risks identified for the project that might cause time overrun, scope creep or cost increases, especially as not all the risks can be mitigated or avoided. Some risks will need to be accepted, passively or actively (with a contingency reserve in mind). Also, there is a possibility of risks not being identified, and the reserve will help to have a budget to mitigate them if they were to occur.

In the FAARPII-Package 1 project several risks were identified that might have an impact on output or phase deadlines and costs, for example:

- There are additional lands that could be necessary for the construction.
- Latent defects in the existing infrastructure will have an impact on constructions costs.

- Natural disasters may occur during the construction phase and cause delays and or loss of resources

As mentioned in the Project Charter, the schedule is one of the constraints that is flexible for adjustments. There are several activities that are flexible on their start and finish dates as seen in the project slack of the project schedule. With regards to the schedule reserve, it’s important to mention that the activities in the critical path should not be given extra work periods as they don’t actually have schedule flexibility without affecting the project end date.

Regarding the contingency reserve for accepted risks or for the unidentified risks, the contingency reserve budget can be up to 10% of the total project budget, according to DIPE policies. Management reserve shall be calculated at 3% over the project base cost.

As the project data evolves and the project manager is able to acquire more accurate data, the reserve analysis can be increased or reduced.

Chart 33. Budget Table (Source: A. Jn. Baptiste, the author, 2019)

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
100	Procure consultants	Procurement of consultants according to the Caribbean Development Bank's procurement guidelines and the Finance Act of Saint Lucia	70	Project Manager		$3,129.00		$3,129.00
150	Undertake traffic studies	Carry out traffic studies to inform the pavement design for a design life of 20 years.	10	Traffic Engineer,10 automatic counters,4 technicians.		$17,000.00		$17,000.00
200	Undertake topographic surveys	Carry out topographic studies to locate the road corridor, to set out the road widening, laybys and locate drains and retaining structures.	10	1 Engineering surveyor,2 survey technicians		$11,000.00		$11,000.00
250	Undertake geotechnical studies	Carry out geotechnical investigations to compile the materials report which will inform the structural design review of the road pavement and retaining structures.	10	Materials engineer,1 technicians		$7,750.00		$7,750.00
300	Undertake utility assessment	Carry out a Utility assessment to inform replacement of old water lines, and the relocation of	5	1 utilities engineer,2 technicians,1 pickup truck.		$3,375.00		$3,375.00

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
		electricity poles and telecommunication infrastructure.						
350	Undertake Engineering designs review	Carry out the design for drainage structures, a new bridge, retaining walls, slope stabilization bus stops and laybys and road pavement structure.	20	1 team leader,1 design engineer,1 CAD technician		$52,000.00		$52,000.00
400	Consult the public	Engage the affected public along the road corridor on the proposed project with a view to addressing all concerns.	5	Project manager, Consultant's team leader.		$8,250.00		$8,250.00
450	Undertake cost estimate review	Carry out the necessary analysis to inform the total cost of the works to facilitate the bidding exercise.	5	Quantity Surveyor,2 quantity surveying technicians.		$4,000.00		$4,000.00
500	Prepare bid documents	Undertake the necessary to prepare the required documentation to facilitate the submission of full proposals by interested contractors.	5	Team leader.		$6,250.00		$6,250.00
550	Procure works contractor	Procurement of contractors for the works according to the	70	Project manager.		$3,129.00		$3,129.00

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
		Caribbean Development Bank's procurement guidelines and the Finance Act of Saint Lucia						
600	Carry out kick off meeting	Organize and hold a meeting with the selected contractor and the sponsor prior to the commencement of works to ensure clarity in respect of protocols.	1	Project manager, Team leader.		$1,250.00		$1,250.00
650	Supervise works	Undertake the supervision of all works according to the consultancy agreement between the sponsor and the consultant.	55	Resident Engineer,4 Technicians			$134,750.00	$134,750.00
700	Construct culvert foundation	Undertake the necessary to build the culvert foundation according to the design drawings.	2	Backhoe, Operator for Backhoe, Tipper Truck, 1 Labourer, 2 Masons, Supervisor, Concrete (C35/20) , Reinforcement ,Formwork, 1 Concrete Batching Plant	$603.00			$603.00
710	Construct Culvert	Undertake the necessary procedures to construct new culvert.	3	Formwork, Reinforcement, Concrete(C35/20), 2 Labourers, 2 Masons, Supervisor, 900 mm diameter concrete pipe culverts.	$6,000.00			$6,000.00

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
720	Construct formwork to culvert	Undertake the necessary to construct formwork for culvert pipe installation.	0.5	Carpenter, Foreman,1 Labourer, timber	$1,900.00			$1,900.00
730	Construct catch basin to new culvert	Undertake the necessary to construct the catch basin to the new culvert.	2	Formwork, Reinforcement, Concrete(C35/20), 2 Labourers, 1 Mason, Supervisor.	$8,000.00			$8,000.00
740	Excavate for rip rap protection.	Undertake the necessary to facilitate placement of rip rap as per design drawings.	1	1 Backhoe,1 supervisor, 1 Labourer	$210.00			$210.00
750	Prepare excavated surfaces	Undertake the necessary to prepare excavation for rip rap as per design drawings	0.5	2 Labourers, Supervisor	$240.00			$240.00
760	Place geotextile material on existing ground	Undertake the necessary to adequately place geogrid to receive rip rap as per design drawings.	0.25	2 Labourers, Supervisor, Geotextile	$945.00			$945.00
770	Construct rip rap protection.	Undertake the necessary to construct the bridge joints according to the design drawings.	1	Supervisor,2 labourers, excavated boulders	$2,500.00			$2,500.00
780	Construct asphalt overlay to culvert deck.	Undertake the necessary to overlay the culvert deck with 75 mm asphaltic concrete according to designs.	0.25	Asphalt-75mm, Asphalt Paver, Asphalt Paver Operator, Roller, 2 Labourers, Foreman	$7,229.40			$7,229.40
790	Construct, install and	Undertake the installation	3	RHS, Welder, paint, painter,	$13,717.50			$13,717.50

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
	paint railings to culvert	and painting of culvert railings to design.		Labourer, supervisor				
800	Build slope stabilization	Implement slope stabilization mechanisms as per design over discrete sections of road.	10	Supervisor,50 M ^{2}, type A geogrid,50 plants of vertivert grass,2 Labourers, Tipper truck, driver.	$2,750.00			$2,750.00
850	Dig earthen drains	Dig earthen drains as per designs over 803m of road.	5	Back hoe-1 No, Tipper Trucks-1, Operators-1, Supervisor, laborers-4.,1 driver.	$220,825.00			$220,825.00
900	Construct lined drains	Construct a total length of 274 m of concrete drains of various sections as per design.	15	Concrete, Formwork, Reinforcement, 6 Labourers, Supervisor, Masons-3, 1 Tipper truck and driver.	$94,600.00			$94,600.00
950	Repair concrete drains	Repair 803 m of concrete drains of various cross sections as per design.	10	Concrete, Reinforcement, 4 Labourers, Supervisor, Formwork,' Masons-2, Tipper truck and driver	$120,450.00			$120,450.00
1000	Construct retaining wall	Construct retaining wall as per design.	10	Rubble, Concrete, Reinforcement, Tipper Truck, Driver for Vehicle, 4 Labourers, Supervisor, Masons -2	$21,452.00			$21,452.00
1050	Repair masonry retaining walls	Repair retaining walls as per design at identified locations along the road corridor.	5	1 Mason, Concrete, Rubble, 1 Labourer, Supervisor	$3,765.44			$3,765.44

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
1100	Construct road widening including ancillary works	Undertake road widening as informed by the new horizontal road alignment along with ancillary works to receive subbase and base.	10	Backhoe-2, 2 Tipper Trucks,4 Labourers, Supervisor	$29,260.80			$29,260.80
1150	Place road sub base in road widening	Undertake construction of road sub base as per new pavement design over road widening.	5	2400 M ^{2} Crusher Run-100mm, 2 Rollers, Operators, 4 Tipper Trucks, Supervisor, Drivers, 6 Labourers	$100,800.00			$100,800.00
1280	Place subbase/base in laybys at tourist viewpoints-1 No.	Undertake construction of road sub base/base as per new pavement design in laybys at tourist viewpoints.	1	25 M ^{2} Crusher run-200, Supervisor, Roller, Operator, 2 Labourers	$1,932.00			$1,932.00
1290	Place subbase/base in bus stops-10 No.	Undertake construction of road sub base/base as per new pavement design in laybys at bus stops.	5	230 M ^{2} Crusher run-200mm, Supervisor, Roller, Operator, 2 Labourers	$19,320.00			$19,320.00
1300	Repair culverts	Undertake the repair of 7 culverts as per design.	7	Concrete, Reinforcement, Formwork, 2 Labourers, 2 masons, Supervisor, concrete culvert pipes	$20,027.00			$20,027.00
1310	Clean and desilt culverts	Undertake the clearing of 7 culverts at various locations as per design.	5	4 Labourers, Tipper Truck, Driver	$7,000.00			$7,000.00

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
1320	Relocate telecommunication infrastructure	Undertake the relocation of telecommunication infrastructure at predetermined locations as per design.	5	Telecommunication technician 1, Telecommunications Subcontractor.	$50,000.00			$50,000.00
1340	Replace old water infrastructure with new	Undertake the replacement of aged water infrastructure at predetermined locations as per design.	10	WASCO Technician, WASCO Subcontractor	$75,000.00			$75,000.00
1350	Relocate power lines	Undertake the relocation of power lines at predetermined locations as per design.	5	Power company's technician, Power Company subcontractor.	$50,000.00			$50,000.00
1160	Place road base in road box	Undertake construction of road base as per new pavement design over 1.12 km of road.	10	Crusher run base-100mm, 2 Tipper Trucks, 4 Labourers, Supervisor, 1 Grader,1 Roller, Operators	$100,800.00			$100,800.00
1170	Construct concrete curbs to layby at tourist viewpoint	Construct concrete curbs to 1 laybys at tourist viewpoint as per design.	1	Concrete, Concrete truck, Reinforcement, Formwork, 1 Labourer, Supervisor,1 mason.	$2,288.00			$2,288.00
1180	Construct concrete curbs to laybys at bus stops	Construct concrete curbs to 10 laybys at bus stops as per design	5	Concrete, Concrete truck, Reinforcement, Formwork, 4 Labourers, Supervisor,2 masons.	$10,153.33			$10,153.33

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
1360	Construct asphalt overlay to roads	Construct asphaltic concrete overlay to 1.12 km of road as per design.	5	Asphal-75mm, Asphalt Pavers-1, 6 Labourers, Supervisor, Rollers- 2,Sweeper,Technician	$240,000.00			$240,000.00
1370	Place asphalt to laybys at tourist viewpoints	Place 75 mm asphaltic concrete over 1 layby at tourist viewpoint.	0.25	Asphal-75mm, Asphalt Pavers-1, 2 Labourers, Supervisor, Roller- 1,Sweeper,Technician	$3,613.80			$3,613.80
1380	Place asphalt to bus laybys	Place 75 mm asphaltic concrete over 10 bus laybys	1	Asphal-75mm, Asphalt Pavers-1, 2 Labourers, Supervisor, Roller-1,Sweeper,Technician	$36,613.80			$36,613.80
1390	Construction of bus shelters	Undertake construction of 10 bus shelters as per architectural design	20	10 prefab structures.2 carpenters,2 masons,2 technicians,1 small crane,operator,1 tipper truck.	$136,666.67			$136,666.67
1400	Construct Amenities	Undertake construction of amenities to touristic viewpoint as per design.	10	1 prefab structure,2 carpenters,2 masons,1 technician,1 small crane, operator,1 tipper truck.	$25,500.00			$25,500.00
1410	Erect signage to bus stops and tourist viewpoints	Undertake the placing of bus stops and tourist viewpoint signage as per signage schedule.	2	11 Traffic Signs, 11 Poles, Concrete , 2 Labourers, Supervisor,1 tipper truck	$8,800.00			$8,800.00
1420	Erect vertical road signs	Undertake the placing of vertical road signs as per signs schedule.	1	6 Traffic Signs, 6 Poles, Concrete , 2 Labourers, Supervisor,1 tipper truck.	$4,800.00			$4,800.00
1430	Place road markings	Undertake the painting of road markings as per the	5	Thermoplastic paint, Road Marking Machine, Machine	$81,000.00			$81,000.00

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
		road marking schedule.		Operators, Supervisor, Tipper truck				
1440	Install traffic safety devices	Undertake the installation of traffic safety devices along the road as per designs.	5	100 M Guardrails, Concrete, Labourers-4, Supervisor, Tipper truck.	$25,000.00			$25,000.00
1450	Issue taking over certificate	Prepare and issue the taking over certificate on substantial completion of the works.	0	Resident Engineer	$0.00			$0.00
1460	Undertake supervision during defects liability period.	Undertake the supervision of all works during defects liability period, according to the consultancy agreement between the sponsor and the consultant.	260	Resident Engineer			$52,000.00	$52,000.00
1480	Prepare final account for works contract	Undertake preparation of final account for the contracted work.	5	Quantity Surveyor, Chief Resident Engineer			$6,750.00	$6,750.00
1490	Prepare project closeout report	Compile the project closeout report for project sponsor.	10	Resident Engineer			$8,000.00	$8,000.00
1500	Issue performance certificate	Prepare and the issue the performance certificate on the fulfilment by the contractor of his obligations at the end of the defects liability period.	0	Resident Engineer			$0.00	$0.00

Activity Code	Activity Name	Activity Description	Duration/Work days	Resources	Resource Cost for works	Design Review and Procurement	Supervision Cost and Project Closeout cost	Total cost
1470	Prepare as built drawings	Compile and submit to the sponsor a complete pictorial representation via design drawings of all the completed works.	10	AutoCAD Technician, Resident Engineer			$9,750.00	$9,750.00
1510	Close project office	Carry out the closing procedures for the project office.	5	Contractor, Resident Engineer			$4,000.00	$4,000.00
				Construction Costs	$1,533,762.74			
				Design and procurement Cost		$117,133.00		
				Supervision and Closeout cost			$215,250.00	
				General Items for Works Contract				$192,310.00
				Project management during design review and supervision				$16,808.09
				Base cost				$2,075,263.83
					Base cost plus contingency reserve of 10%- Cost baseline		$2,282,790.21	
					Management Reserve-3% of base cost		$62,257.91	
					Cost baseline plus 12.5% Vat		$2,568,138.99	

4.4.6.3 Justification for Contingency and Management Reserve

According to PMI's *Practice Standard for Project Risk Management,* a project risk is “an uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives” (PMI, 2009). As opposed to issues, which are incidents that are occurring or have already occurred, a risk is a possible future event with a probability of occurrence ranging between zero and one. For each known risk that is added to the risk register, some form of risk response should be planned. That way, if risks occur and become issues, there is a plan in place to deal with the impact swiftly and avoid too much damage to the project and its objectives.

Contingency reserve and management reserve are options to respond to risks so that these risks do not compromise the project cost. Management reserve is kept aside to cover “unknown unknowns,” or risks that occur but were not accounted for. For the “known unknowns,” or risks that have been kept in the risk register, the contingency reserve can be part of the overall risk response strategy.

Along with the cost baseline, the management reserve is the final piece of the cost budget (PMI, 2013). On the other hand, the project manager is typically authorized to spend what is in the contingency reserve to address risks as they occur. Therefore, the project manager is accountable for its use.

Starting from the bottom, estimates are rolled up into the overall project estimate, and the contingency reserve is added to form the cost baseline. The cost baseline, with management reserves, is the cost budget for the project.

1.So why should FAARPII have a contingency reserve? Primarily, it is a valuable risk response strategy that helps insure the project against debilitating time and monetary costs.

2.The second justification for using a risk contingency reserve is to improve the predictability of the project outcomes. By pooling the risk contingency costs together so the cost of any risk occurrence can be absorbed, it is easier to track

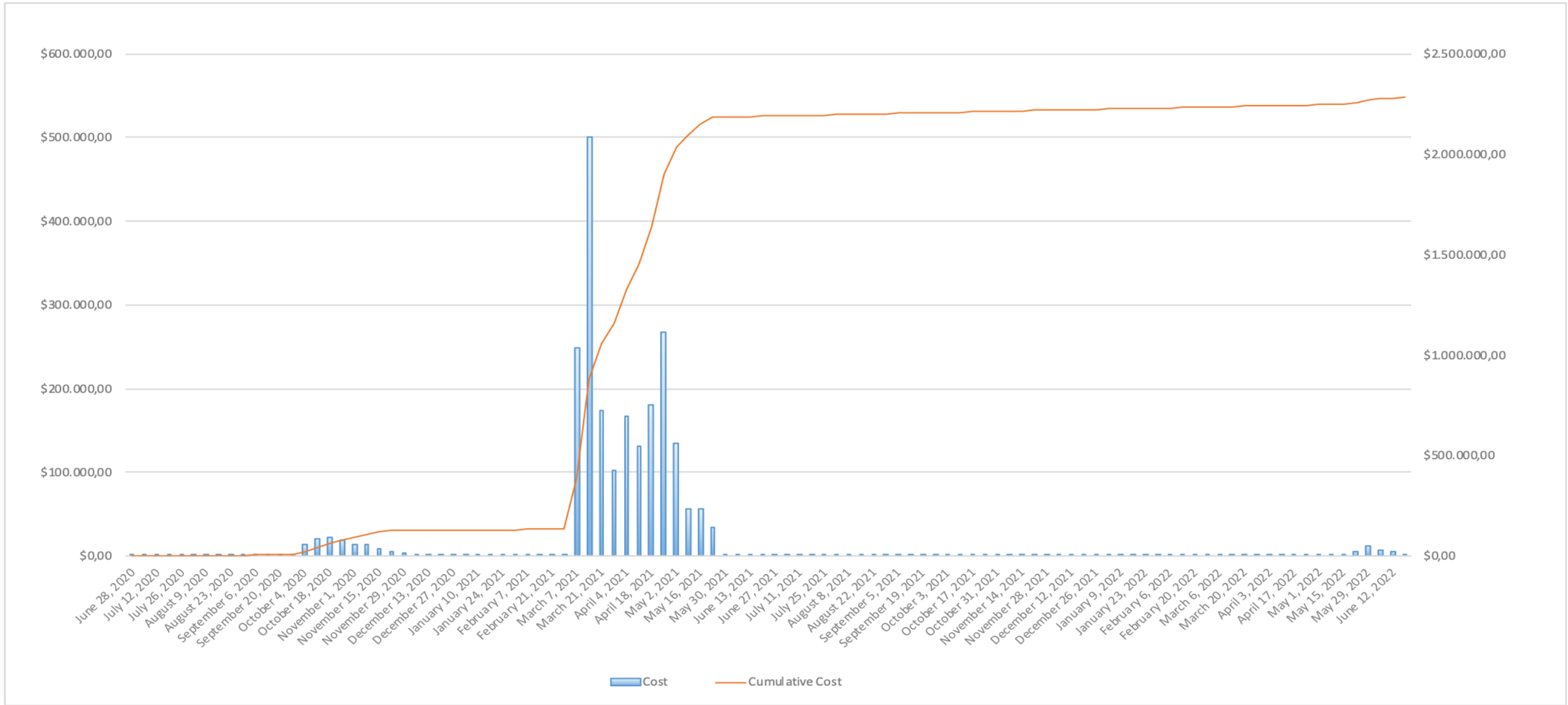
risk occurrence. Without the contingency reserve, those extra days and money will come out of the actual schedule and budget, causing delays and cost overruns. If this happens, then the project can be derailed.

3.So we will use the contingency reserve when a risk occurs as part of the risk response strategy.

Developing a risk contingency reserve, including it in the cost and schedule baselines, and tracking its use as the project progresses will help increase the predictability of project outcomes. If we use it properly, the risk contingency reserve can act as a shield against the damage that the project can sustain through the occurrence of risks.

S-CURVE FOR COST BASELINE

The following figure shows the S- Curve for Cost Baseline.



Name	Start	Finish	% Complete
FAARPII-Package 1(Piat Road)	7/1/20	6/22/22	0%

Figure 33. Cash Flow Diagram for FAARPII-Package 1 (Source: A. Jn. Baptiste, the author, 2019

4.4.7 Cost Control Procedure

4.4.7.1 Process Description and Importance

The cost control process is one of the processes of the Cost Management knowledge area. Its main objective is to maintain the cost baseline, defined previously in the determined budget process, throughout the project. This will be done by monitoring the status of the project work and analysing the project's performance indicators to determine corrective or preventive actions before the cost baseline or project performance is affected.

In order to proceed with this process, the following components of the project management plan are important: cost management plan, performance measurement baseline and the cost baseline. In addition, the lessons learned from previous phases might help with cost control and the work performance data is an essential input as it contains information about the status of the project and the costs that have been used.

There are several techniques that can be used to control the costs of the project, however, for FAARPII special emphasis will be placed on using techniques to analyse project data. This technique will help with the monitoring of project performance to determine causes for variances relative to the cost baseline and use the results to decide on the implementation of preventive or corrective measures. Also, it is necessary for FAARPII to identify if performance is improving or deteriorating. In addition to the data analysis techniques, the project team will rely on Project Management Information Systems to monitor project performance, display trends graphically for easier comprehension and to forecast possible project outcomes.

4.4.7.2 Detailed Description of How the Project Budget is to be controlled

The control cost process for FAARPII will follow the procedures and guidelines established by the Department of Infrastructure, Ports and Energy for its infrastructure projects. The DIPE templates for work performance data reports and tracking will be used and the MS Project tool will be used for the monitoring of project schedule, resources and costs.

Several data analysis techniques will be used for this process, like the Earned Value Analysis. There will be constant monitoring and comparison of the performance measurement baseline (scope, cost and schedule baselines integrated) to the actual schedule and cost performance. This monitoring will be done by the project manager and will determine the variance of costs, taking into account the earned value and the actual costs of the work completed. With this same data, the cost efficiency of the work completed will be measured using the Cost Performance index technique.

In addition, charts will be created with the project data, for monitoring purposes, using the S-curve representation to display if the project is performing over or under budget.

Another important factor that will be monitored during this process is the contingency and management reserves, to determine if these reserves are being used, how much is still available, if the reserve is still needed or if there is a need for more.

It’s also important to mention that the project manager will communicate the results of the control cost process to relevant stakeholders to assure that they are updated with the performance of the project throughout the project. This is will be done sending reports via email and presenting the reports in follow up meetings. Any change request will be documented and recorded.

4.4.7.3 Cost Change Management Process Description

Any change requested to one of the project management components, that might be affected by this process, like the cost baseline, performance measurement baseline or the cost management plan, will need to be reviewed, approved and managed during the Integrated Change Control process. These change requests will need to be approved by the Ministry of Finance, the Department of Infrastructure, Ports, Energy and Labour and the Caribbean Development Bank.

Other project documents that could be affected by this process are the assumption log, the basis of estimates, the cost estimates, lessons learned register and the risk register.

4.4.7.4 Cost Control and Monitoring Using Earned Value Management.

4.4.7.4.1 Earned Value Management.

Earned Value Analysis is a method of performance measurement. Earned Value is a program management technique that uses “work in progress” to indicate what will happen to work in the future. Earned Value Management (EVM) is a system for planning and controlling the project cost performances. EVM establish work packages earned value baseline by integrating project scope, time schedule and cost objectives.

Earned value analysis serves two main purposes. It analyses cost changes which is resulting in time and cost over-run or under-run so that timely corrective actions are taken such as modification of cash flow, updating financial forecast and project profitability expectations. Analysis of variance from the baseline using an earned value management system gives variety of variances which are analysed to provide status of project, to initiate corrective actions and to forecast future trends.

4.4.7.4.2 Schedule Analysis

Earned value is a technique for measuring project performance according to project cost and schedule. The comparison between budgeted and actual performance is performed. Three earned value parameters as shown below will be used to measure cost performance in respect of FAARPII:

- **Planned Value (PV)** It is the cost of the project according to the schedule of the project. it is also called Budgeted cost of work scheduled (BCWS)

- **Earned Value (EV)** It is the budgeted cost of the work performed to date. It is the cumulative budgeted cost incurred in activities that have been completed on the due date.

- **Actual Cost (AC)** It's the actual cost that have been spent on the project to date. It is also called as actual cost of work performed (ACWP).

The variances will be used to check deflection or deviation of the project from the path of the original schedule. They will also be used to analyse the extent and causes for the delays of works or tasks of the project. Following are the two variances,

- **Cost Variance**:_It will be used to check the difference between the proposed planned project and present project on a specific date. It shows the variation of the project in the form of cost. The formula used for calculating cost variance is:

COST VARIANCE =Earned Value – Actual Cost

- **Schedule Variance**: It will be used to examine the deflection of present project from the planned project. If considerable change appears then the

project objectives must be revised. The formula for calculating the schedule variance is,

SCHEDULE VARIANCE= Earned Value – Planned Value

The indices will be used to forecast the present trends in different forms such as productivity, cost and time. There are two types of indices that will be used:

- Cost variance index = (EV – AC)/EV OR (BCWP-ACWP)/BCWP
- Schedule variance index = (EV-PV)/EV OR (BCWP-BCWS)/BCWS

Budgeted cost on completion of the contracted work at contract rate is called BA

- **Interpretation of the Indices:**

➢ **Cost Variance (CV)**

CV greater than 0 is good (under budget).

➢ **Cost Performance Index (CPI)**

CPI greater than 1 is favourable (under budget):
< 1 means that the cost of completing the work is higher than planned (bad);
= 1 means that the cost of completing the work is right on plan (good);
> 1 means that the cost of completing the work is less than planned (good or sometimes bad).

Having a CPI that is very high (in some cases, very high is only 1.2) may mean that the plan was too conservative, and thus a very high number may in fact not be good, as the CPI is being measured against a poor baseline. Management or the stakeholders may be upset with the project team as an overly conservative

baseline ties up available funds for other purposes, and the baseline is also used for manpower planning.

4.4.7.4.4 Estimate at completion (EAC)

EAC is the project manager's projection of total cost of the project at completion. This measure assumes, that the performance of the project (or rather a deviation of the actual performance from a baseline) to date, gives a good indication of what a performance (or rather deviation of a performance from a baseline) will be in the future. In other words, this formula is using statistics of the project to date to predict future results. Therefore, it must be used carefully, when the nature of the project in the future is likely to be different from the one to date (e.g. performance of the project compared to baseline at the design phase may not be a good indication of what it will be during a construction phase).

4.4.7.4.3 Estimate to Complete (ETC)

ETC is the estimate to complete the remaining work of the project. ETC must be based on objective measures of the outstanding work remaining, typically based on the measures or estimates used to create the original planned value (PV) profile, including any adjustments to predict performance based on historical performance, actions being taken to improve performance, or acknowledgement of degraded performance.

While algebraically, ETC = EAC-AC is correct, ETC should *never* be computed using either EAC or AC. In the previous equation, ETC is the independent variable, EAC is the dependent variable, and AC is fixed based on expenditures to date. ETC should always be reported truthfully to reflect the project team estimate to complete the outstanding work. If ETC pushes EAC to exceed BAC, then project management skills will be employed to either recommend performance improvements or scope change, but never to force ETC to give the "correct"

answer so that EAC=BAC. Managing project activities to keep the project within budget is a human factors activity, not a mathematical function.

4.4.7.4.5 To-Complete Performance Index (TCPI)

The TCPI provides a projection of the anticipated performance required to achieve either the BAC or the EAC. TCPI indicates the future required cost efficiency needed to achieve a target BAC (Budget at Completion) or EAC (Estimate at Completion). Any significant difference between CPI, the cost performance to date, and the TCPI, the cost performance needed to meet the BAC or the EAC, should be accounted for by management in their forecast of the final cost.
For the TCPI based on BAC (describing the performance required to meet the original BAC budgeted total):or for the TCPI based on EAC (describing the performance required to meet a new, revised budget total EAC):

This implies, that if revised budget (EAC) is calculated using the Earned Value methodology formula (BAC/CPI), then at the moment when TCPI based on EAC is the first time calculated, it will always be equal to CPI of a project at that moment. This happens because when EAC is calculated using the formula BAC/CPI it is assumed that cost performance of the remaining part of the project will be the same as the cost performance of the project to date.

4.4.8 Approval

Approved by:

_____ Date:_____

Permanent Secretary-DIPE

Executive Sponsor

_____ Date:_____

Permanent Secretary-Ministry of Finance

Financial Sponsor

_____ Date:_____

Chief Engineer-DIPE

Project Manager

4.5 Project Quality Management Plan

4.5.1 Introduction

According to the Project Management Institute's Construction Extension to The PMBOK® Guide-2016**,** Quality standards are comprised of project codes, regulations, and standards. This includes any condition of a contract for which tangible deliverables have been defined and will be used to determine acceptance, including acceptance by default if necessary.

The contract and documents, such as design drawings and specifications, are the principle project quality standards as these specify the applicable statutory and legislative quality requirements, technical quality codes, standards, and regulations.

Contract requirements shall include any and all requirements specified in the project contract documents (e.g., specifications, regulations, legislation, and standards [technical or legislative]). Permits obtained by the Department of Infrastructure shall also become part of the contract. The project management team will consider area-specific standards, specifications, or regulations, including those arising from local, regional, and national regulatory agencies that will affect the project. Specifications, regulations, legislation, and standards shall refer to either performance and acceptance criteria that pertain to the product(s) of the project, or workmanship criteria or how work is to be undertaken.

The quality management plan as a component of the project management plan describes how the project management team will implement the necessary quality control activities for the Department of Infrastructure. The quality management plan contains or makes reference to specific procedures that will be applied for ensuring the quality compliance of the work performed.

The project quality management plan defines the monitoring and controlling activities to be employed, specifically the following

- Item of work to be monitored;
- Reference to the applicable document, specification, or standard and acceptance criteria;
- Applicable verification activities that are conducted and times when these activities are performed in relation to the overall process;
- Responsible parties for the work and verification activities;
- Applicable characteristics and measurements that are taken or recorded; and
- Applicable supporting documentation, which is generated to demonstrate satisfactory or unsatisfactory performance.

4.5.2 Roles and Responsibilities.

Chart 34. Roles and Responsibilities (Source: A. Jn. Baptiste, 2019)

Role	Responsibilities
Project Manager (PM)-1	Responsible for the overall management and implementation of the project including the Quality Management Plan.
Construction Quality Assurance Manager (CQAM)-2	Responsible for quality assurance of the construction.
Design Quality Assurance Manager (DQAM)-3	Responsible for quality assurance of the project design.
Construction Manager (CM)-4	Responsible for quality control inspection and testing of the construction work.
Design Manager (DM)-5	Responsible for design development and quality control of the design work.
Materials Approval Engineer (MAE)-6	Responsible for the approval of

Role	Responsibilities
	materials in accordance with the Construction Contract Specifications.
Quality Testing Supervisor (QTS)-7	Responsible for overseeing all materials testing on the project.

Note:

1.The CQAM and CM role will be undertaken by the Resident Engineer.

2.The MAE and the QTS role will be undertaken by the Senior Laboratory Technician of the Department of Infrastructure's Materials Laboratory.

3.The DQAM and DM role will be undertaken by the project engineer

4.5.3 Key Factors Related to Quality

Chart 35. Key Factors Related to Quality (Source: A. Jn. Baptiste, 2019)

Factor	Factor Definition	Quality Objective
Concrete Strength	Characteristic 28 day strength	To ensure that concrete structures can adequately design loads.
Compaction of road sub base course	Density of laid subbase material	To ensure that the subbase material provide adequate load bearing response to design traffic loads.
Compaction of road base course	Density of laid base course	To ensure that the base can adequately transfer the traffic loads from the surface course to the

Factor	Factor Definition	Quality Objective
		subbase.
Asphaltic Concrete Density	Measure of the compaction of the asphaltic concrete layer	To ensure minimum deformation of the asphaltic concrete surface under design traffic loads.
International Roughness Index	Measure of the roughness of the road pavement.	To ensure adequate road user comfort and minimum vehicle operating cost.
Geometric design of crest and sag curves	Layout of the horizontal and vertical road profile	To ensure maximum driver safety and comfort for the road design speed.
Geometric design of horizontal alignment-super elevation.	The transverse slope provided to counteract the effect of centrifugal force and reduce the tendency of vehicle to overturn and to skid laterally outwards when moving in a curve.	To ensure driver safety when transitioning in curves by reducing the risk of overturning.
Environmental compliance	Conformity with mitigative measures to minimize risk to the environment	Ensure minimal negative impact of the project on the environment.

4.5.4 Metrics and the Quality Baseline

Chart 36. Metrics and Quality Baseline (Source: A. Jn. Baptiste, 2019)

Factor	Metrics	Metric definition	Expected outcome/result	Measurement frequency	Responsible
Concrete Strength	Compressive Strength	Crushing strength of a standard concrete cube after 7 days according to ASTM (American Society for the Testing of Materials) standards.	Minimum strength to be 14 N/mm^2.	Seven days after concrete is poured.	2,4,6,7
Compaction of road sub base course	California Bearing Ratio (CBR)	CBR test shall be carried out in accordance with standard test procedure as set out in British Standard (BS) 1377.	Minimum CBR value shall be 25 % on samples which have been compacted at optimum moisture content and soaked for 96 hours.	Test shall be carried out routinely at 30-meter intervals on the finished subbase layer.	2,4,6,7
Compaction of road base course	California Bearing Ratio (CBR)	CBR test shall be carried out in accordance with standard test procedure as set out in AASHTO (American Association of State Highway and Transport Officials) (T180-D)	The crushed aggregate base course material shall have a 4-day soaked CBR of not less than 80% when compacted at 100% of modified proctor AASHTO (T180-D)	Test shall be carried out in accordance with AASHTO T 193.	2,4,6,7
Asphaltic Concrete Density	Marshall Density	The Marshall stability of the mix is defined as a maximum load carried by a compacted specimen at a standard test temperature of 600 °C. The flow is measured as the deformation in units of 0.25 mm between no load and maximum load carried by the specimen during stability test. This test attempts to get the optimum binder content for the aggregate mix type and traffic intensity.	Marshall test specimens from the mix or the cored samples from the pavement shall not fall below 100% and 97% of the laboratory Marshall density, or the values of the Marshall stability/flow ratio.	Four trucks shall be selected at random throughout the day, and two random samples shall be taken from each truck. Cores shall be taken from the areas of finished bitumen macadam at the four locations corresponding to the sampled trucks.	2,4,6,7

Factor	Metrics	Metric definition	Expected outcome/result	Measurement frequency	Responsible
Pavement Roughness	International Roughness Index (IRI)	Pavement roughness is defined as an expression of irregularities in the pavement surface that adversely affect the ride quality of a vehicle (and thus the user	The IRI is based on the average rectified slope (ARS), which is a filtered ratio of a standard vehicle's accumulated suspension motion (in mm, inches, etc.) divided by the distance travelled by the vehicle during the measurement (km, mi, etc.). IRI is then equal to ARS multiplied by 1,000. For the new pavement the IRI must be less than 3.	Must be carried out on completion of every 500m of paving using a Irimeter.	2,4,6,7
Geometric design of crest and sag curves.	Rate of vertical curvature	Conformance with the United Kingdom (UK) Transport and Road Research Laboratory (TRRL)-Road Note 6 and AASHTO standards. Measure of the rate of vertical curvature K(m/% grade change).	K must be greater than or equal to 138	Design calculation check must be done for every vertical curve.	3,5
Geometric design of super elevation.	Rate of Super elevation (e)	Super elevation is the transverse slope provided to counteract the effect of centrifugal force and reduce the tendency of vehicle to overturn and to skid laterally outwards by raising the pavement outer edge with respect to inner edge. super elevation is represented by " e ".Conformance with the United Kingdom (UK) Transport and Road Research Laboratory (TRRL)-Road Note 6 and AASHTO standards .-Measure of the rate of super elevation e (%).	e (%) must be less than 7%	Design calculation check must be done for every horizontal curve.	3,5

Factor	Metrics	Metric definition	Expected outcome/result	Measurement frequency	Responsible
Environmental compliance	Conformity with the Environmental Protection Act of Saint Lucia	Non-conformance or conformance with designed environmental safeguards.	Conformance with project environmental safeguards.	Random checks during project implementation as specified by the Environmental Protection plan.	1

4.5.5 Quality Activities Matrix

Chart 37. Quality Activities Matrix (Source: A. Jn. Baptiste, 2019)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
Concrete structures.	To be constructed according to (British Standard) BS 594987:2010	Manage: 1. Preconstruction ○ Review of Plans and Specifications ○ Quality standards ▪ Review Requirements ▪ Clarify Any Ambiguity ▪ Samples or Mock-ups ○ Constructability Reviews ○ Documenting Existing Conditions ○ Material Management ▪ Transportation Factors ▪ Receiving at the Jobsite ▪ Storage and Protection ○ Subcontractor factors ▪ QA/QC Program ▪ Field Procedures ▪ Fabrication Shop Inspections ○ Testing ▪ Requirements ▪ Procedures ▪ Documentation 2. Construction Operations ○ Zero Defect Program ○ Quality Assurance Administration	1.To be undertaken prior to construction 2.To be undertaken during construction as required.	Contractor's quality management team. Contractor's quality management team.

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		○ Roles and Responsibilities ○ Inspection and Testing Plan ○ Inspection Checklists ○ Quality Assurance(QA) Process ▪ Specified Quality Requirements ▪ QA Process ▪ Pre-Installation Meeting and Inspection ▪ First Work-in-Place Meeting and Inspection ▪ Follow-Up or Daily Inspections ○ Inspections ▪ Inspection schedule ▪ Pre-Cover-Up and Pre-Closure Inspections ▪ Documentation ▪ Written Report ▪ Digital Pictures ○ Non-conformance Procedures ▪ Report ▪ Tracking ▪ Correction ○ Material Verification ○ Water Intrusion Prevention ▪ Preconstruction ▪ Inspections During Construction ○ Protection of the Work		
		Control: **Qualifications of Labs** All QC testing will be performed by the Ministry of Infrastructure Materials	Frequency to be determined in accordance with ASTM (American Society for the	

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		Laboratory reporting directly to the CQAM. The CQAM will inspect the labs and check their certification a minimum of once every six months. **Non-Conforming Work** During construction and placement of materials, the supervisory consultant's field personnel reject workmanship or materials that are not in accordance with the specifications. The construction field personal then have the opportunity to correct the workmanship or materials in order to bring the work in accordance with the specifications. **Non-Conformance Report Identification** The design and construction teams and supervisory staff are responsible for identifying non-conforming work. Any completed work not meeting the plans, specifications and contract requirements is to be deemed non-conforming. Any of the supervisory staff may prepare a non-conformance report (NCR) for review by the CQAM. This report must detail the area of the problem, and cite from the plans, specifications or contract, how or why the work does not conform. The outstanding reports will be discussed in a review of the NCR log at the weekly quality management task force meeting. **Non-Conformance Remediation (NCR)** The NCR has several avenues for remediation depending on the severity of the problem. Among them are: • Remedy the situation—Contractor corrects deficient work. • Prepare an RFI (Request for Information) with proposed remedy to obtain the intended design purpose. • Design-Related NCR Issue—The DQAM or CQAM will issue the NCR and request design review of the non-conformance.	Testing of Materials) standards.	Construction Manager (CM), Materials Approval Engineer (MAE), Construction Quality Assurance Manager (CQAM), Quality Testing Supervisor(QTS)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		• Price Reduction—for the work element outlined in the contract specifications, the CQAM will perform the calculations in accordance with the contract, obtain written approval from the DM of structural adequacy if applicable, and forward this information to the Project Manager for administrative closure of the NCR. • Remove and Replace—The CQAM may require the CM to remove and replace any non- conforming work. Remediation must have the Employer's concurrence and may require a change order. **Removal of Work** If the Employer does not agree with the remedial actions set forth in an NCR, it has the authority to call for removal of the non-conforming work.		

Road subbase	To be constructed to the American Association of State Highway and transportation Officials (AASHTO) standards.	Manage:
		
		1. Preconstruction
		  ○ Review of Plans and Specifications
		  ○ Quality standards
		  ▪ Review Requirements
		  ▪ Clarify Any Ambiguity
		  ▪ Samples or Mock-ups
		  ○ Constructability Reviews
		  ○ Documenting Existing Conditions
		  ○ Material Management
		  ▪ Transportation Factors
		  ▪ Receiving at the Jobsite
		  ▪ Storage and Protection
			1.To be undertaken prior to construction	Contractor's quality management team.

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		○ Subcontractor factors ▪ QA/QC Program ▪ Field Procedures ▪ Fabrication Shop Inspections ○ Testing ▪ Requirements ▪ Procedures ▪ Documentation 2. Construction Operations ○ Zero Defect Program ○ Quality Assurance Administration ○ Roles and Responsibilities ○ Inspection and Testing Plan ○ Inspection Checklists ○ Quality Assurance(QA) Process ▪ Specified Quality Requirements ▪ QA Process ▪ Pre-Installation Meeting and Inspection ▪ First Work-in-Place Meeting and Inspection ▪ Follow-Up or Daily Inspections ○ Inspections ▪ Inspection schedule ▪ Pre-Cover-Up and Pre-Closure Inspections ▪ Documentation ▪ Written Report ▪ Digital Pictures ○ Non-conformance Procedures ▪ Report	2.To be undertaken during construction as required.	Contractor’s quality management team.

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		▪ Tracking ▪ Correction ○ Material Verification ○ Water Intrusion Prevention ▪ Preconstruction ▪ Inspections During Construction ○ Protection of the Work		
		Control: **Qualifications of Labs** All QC testing will be performed by the Ministry of Infrastructure Materials Laboratory reporting directly to the CQAM. The CQAM will inspect the labs and check their certification a minimum of once every six months. **Non-Conforming Work** During construction and placement of materials, the supervisory consultant's field personnel reject workmanship or materials that are not in accordance with the specifications. The construction field personal then have the opportunity to correct the workmanship or materials in order to bring the work in accordance with the specifications. **Non-Conformance Report Identification** The design and construction teams and supervisory staff are responsible for identifying non-conforming work. Any completed work not meeting the plans, specifications and contract requirements is to be deemed non-conforming. Any of the supervisory staff may prepare a non-conformance report (NCR) for review by the CQAM. This report	Frequency to be determined in accordance with ASTM (American Society for the Testing of Materials) standards.	Construction Manager (CM), Materials Approval Engineer(MAE), Construction Quality Assurance Manager (CQAM), Quality Testing Supervisor(QTS)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		must detail the area of the problem, and cite from the plans, specifications or contract, how or why the work does not conform. The outstanding reports will be discussed in a review of the NCR log at the weekly quality management task force meeting. **Non-Conformance Remediation (NCR)** The NCR has several avenues for remediation depending on the severity of the problem. Among them are: • Remedy the situation—Contractor corrects deficient work. • Prepare an RFI (Request for Information) with proposed remedy to obtain the intended design purpose. • Design-Related NCR Issue—The DQAM or CQAM will issue the NCR and request design review of the non-conformance. • Price Reduction—for the work element outlined in the contract specifications, the CQAM will perform the calculations in accordance with the contract, obtain written approval from the DM of structural adequacy if applicable, and forward this information to the Project Manager for administrative closure of the NCR. • Remove and Replace—The CQAM may require the CM to remove and replace any non- conforming work. Remediation must have the Employer's concurrence and may require a change order. **Removal of Work** If the Employer does not agree with the remedial actions set forth in an		

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		NCR, it has the authority to call for removal of the non-conforming work		
Road base	To be constructed to the American Association of State Highway and transportation Officials (AASHTO) standards.	Manage: 1. Preconstruction ○ Review of Plans and Specifications ○ Quality standards ▪ Review Requirements ▪ Clarify Any Ambiguity ▪ Samples or Mock-ups ○ Constructability Reviews ○ Documenting Existing Conditions ○ Material Management ▪ Transportation Factors ▪ Receiving at the Jobsite ▪ Storage and Protection ○ Subcontractor factors ▪ QA/QC Program ▪ Field Procedures ▪ Fabrication Shop Inspections ○ Testing ▪ Requirements ▪ Procedures ▪ Documentation 2. Construction Operations ○ Zero Defect Program ○ Quality Assurance Administration ○ Roles and Responsibilities ○ Inspection and Testing Plan	1.To be undertaken prior to construction 2.To be undertaken during construction as required.	Contractor’s quality management team. Contractor’s quality management team.

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		○ Inspection Checklists ○ Quality Assurance (QA) Process ▪ Specified Quality Requirements ▪ QA Process ▪ Pre-Installation Meeting and Inspection ▪ First Work-in-Place Meeting and Inspection ▪ Follow-Up or Daily Inspections ○ Inspections ▪ Inspection schedule ▪ Pre-Cover-Up and Pre-Closure Inspections ▪ Documentation ▪ Written Report ▪ Digital Pictures ○ Non-conformance Procedures ▪ Report ▪ Tracking ▪ Correction ○ Material Verification ○ Water Intrusion Prevention ▪ Preconstruction ▪ Inspections During Construction ○ Protection of the Work		
		Control: **Qualifications of Labs**	Frequency to be determined in accordance with ASTM (American Society for the Testing of Materials) standards.	Construction Manager (CM), Materials Approval Engineer(MAE), Construction Quality Assurance Manager (CQAM),

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		All QC testing will be performed by the Ministry of Infrastructure Materials Laboratory reporting directly to the CQAM. The CQAM will inspect the labs and check their certification a minimum of once every six months. **Non-Conforming Work** During construction and placement of materials, the supervisory consultant's field personnel reject workmanship or materials that are not in accordance with the specifications. The construction field personal then have the opportunity to correct the workmanship or materials in order to bring the work in accordance with the specifications. **Non-Conformance Report Identification** The design and construction teams and supervisory staff are responsible for identifying non-conforming work. Any completed work not meeting the plans, specifications and contract requirements is to be deemed non-conforming. Any of the supervisory staff may prepare a non-conformance report (NCR) for review by the CQAM. This report must detail the area of the problem, and cite from the plans, specifications or contract, how or why the work does not conform. The outstanding reports will be discussed in a review of the NCR log at the weekly quality management task force meeting. **Non-Conformance Remediation (NCR)** The NCR has several avenues for remediation depending on the severity of the problem. Among them are: • Remedy the situation—Contractor corrects deficient work.		Quality Testing Supervisor(QTS)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		• Prepare an RFI (Request for Information) with proposed remedy to obtain the intended design purpose. • Design-Related NCR Issue—The DQAM or CQAM will issue the NCR and request design review of the non-conformance. • Price Reduction—for the work element outlined in the contract specifications, the CQAM will perform the calculations in accordance with the contract, obtain written approval from the DM of structural adequacy if applicable, and forward this information to the Project Manager for administrative closure of the NCR. • Remove and Replace—The CQAM may require the CM to remove and replace any non- conforming work. Remediation must have the Employer's concurrence and may require a change order. **Removal of Work** If the Employer does not agree with the remedial actions set forth in an NCR, it has the authority to call for removal of the non-conforming work.		
Pavement Surface layer.	To be constructed to the American Association of State Highway and transportation Officials (AASHTO) standards.	Manage: 3. Preconstruction ○ Review of Plans and Specifications ○ Quality standards ▪ Review Requirements ▪ Clarify Any Ambiguity ▪ Samples or Mock-ups ○ Constructability Reviews	1.To be undertaken prior to construction	Contractor's quality management team.

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		○ Documenting Existing Conditions ○ Material Management ▪ Transportation Factors ▪ Receiving at the Jobsite ▪ Storage and Protection ○ Subcontractor factors ▪ QA/QC Program ▪ Field Procedures ▪ Fabrication Shop Inspections ○ Testing ▪ Requirements ▪ Procedures ▪ Documentation 4. Construction Operations ○ Zero Defect Program ○ Quality Assurance Administration ○ Roles and Responsibilities ○ Inspection and Testing Plan ○ Inspection Checklists ○ Quality Assurance (QA) Process ▪ Specified Quality Requirements ▪ QA Process ▪ Pre-Installation Meeting and Inspection ▪ First Work-in-Place Meeting and Inspection ▪ Follow-Up or Daily Inspections ○ Inspections ▪ Inspection schedule ▪ Pre-Cover-Up and Pre-Closure Inspections	2.To be undertaken during construction as required.	Contractor’s quality management team.

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		▪ Documentation ▪ Written Report ▪ Digital Pictures ○ Non-conformance Procedures ▪ Report ▪ Tracking ▪ Correction ○ Material Verification ○ Water Intrusion Prevention ▪ Preconstruction ▪ Inspections During Construction ○ Protection of the Work		
		Control: **Qualifications of Labs** All QC testing will be performed by the Ministry of Infrastructure Materials Laboratory reporting directly to the CQAM. The CQAM will inspect the labs and check their certification a minimum of once every six months. **Non-Conforming Work** During construction and placement of materials, the supervisory consultant's field personnel reject workmanship or materials that are not in accordance with the specifications. The construction field personal then have the opportunity to correct the workmanship or materials in order to bring the work in accordance with the specifications. **Non-Conformance Report Identification** The design and construction teams and supervisory staff are	Frequency to be determined in accordance with ASTM (American Society for the Testing of Materials) standards.	Construction Manager (CM), Materials Approval Engineer(MAE), Construction Quality Assurance Manager (CQAM), Quality Testing Supervisor(QTS)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		responsible for identifying non-conforming work. Any completed work not meeting the plans, specifications and contract requirements is to be deemed non-conforming. Any of the supervisory staff may prepare a non-conformance report (NCR) for review by the CQAM. This report must detail the area of the problem, and cite from the plans, specifications or contract, how or why the work does not conform. The outstanding reports will be discussed in a review of the NCR log at the weekly quality management task force meeting. **Non-Conformance Remediation (NCR)** The NCR has several avenues for remediation depending on the severity of the problem. Among them are: • Remedy the situation—Contractor corrects deficient work. • Prepare an RFI (Request for Information) with proposed remedy to obtain the intended design purpose. • Design-Related NCR Issue—The DQAM or CQAM will issue the NCR and request design review of the non-conformance. • Price Reduction—for the work element outlined in the contract specifications, the CQAM will perform the calculations in accordance with the contract, obtain written approval from the DM of structural adequacy if applicable, and forward this information to the Project Manager for administrative closure of the NCR. • Remove and Replace—The CQAM may require the CM to remove and replace any non- conforming work. Remediation must have the Employer's concurrence and may require a		

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		change order. **Removal of Work** If the Employer does not agree with the remedial actions set forth in an NCR, it has the authority to call for removal of the non-conforming work.		
Pavement surface	To be constructed to BS and AASHTO standards.	Manage: 1. Preconstruction ○ Review of Plans and Specifications ○ Quality standards ▪ Review Requirements ▪ Clarify Any Ambiguity ▪ Samples or Mock-ups ○ Constructability Reviews ○ Documenting Existing Conditions ○ Material Management ▪ Transportation Factors ▪ Receiving at the Jobsite ▪ Storage and Protection ○ Subcontractor factors ▪ QA/QC Program ▪ Field Procedures ▪ Fabrication Shop Inspections ○ Testing ▪ Requirements ▪ Procedures ▪ Documentation	1.To be undertaken prior to construction 2.To be undertaken during construction as required.	Contractor's quality management team. Contractor's quality management team.

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		2. Construction Operations ○ Zero Defect Program ○ Quality Assurance Administration ○ Roles and Responsibilities ○ Inspection and Testing Plan ○ Inspection Checklists ○ Quality Assurance (QA) Process ▪ Specified Quality Requirements ▪ QA Process ▪ Pre-Installation Meeting and Inspection ▪ First Work-in-Place Meeting and Inspection ▪ Follow-Up or Daily Inspections ○ Inspections ▪ Inspection schedule ▪ Pre-Cover-Up and Pre-Closure Inspections ▪ Documentation ▪ Written Report ▪ Digital Pictures ○ Non-conformance Procedures ▪ Report ▪ Tracking ▪ Correction ○ Material Verification ○ Water Intrusion Prevention ▪ Preconstruction ▪ Inspections During Construction ○ Protection of the Work		

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		Control: **Qualifications of Labs** All QC testing will be performed by the Ministry of Infrastructure Materials Laboratory reporting directly to the CQAM. The CQAM will inspect the labs and check their certification a minimum of once every six months. **Non-Conforming Work** During construction and placement of materials, the supervisory consultant's field personnel reject workmanship or materials that are not in accordance with the specifications. The construction field personal then have the opportunity to correct the workmanship or materials in order to bring the work in accordance with the specifications. **Non-Conformance Report Identification** The design and construction teams and supervisory staff are responsible for identifying non-conforming work. Any completed work not meeting the plans, specifications and contract requirements is to be deemed non-conforming. Any of the supervisory staff may prepare a non-conformance report (NCR) for review by the CQAM. This report must detail the area of the problem, and cite from the plans, specifications or contract, how or why the work does not conform. The outstanding reports will be discussed in a review of the NCR log at the weekly quality management task force meeting. **Non-Conformance Remediation (NCR)** The NCR has several avenues for remediation depending on the severity	Frequency to be determined in accordance with ASTM (American Society for the Testing of Materials) standards.	Construction Manager (CM), Materials Approval Engineer(MAE), Construction Quality Assurance Manager (CQAM), Quality Testing Supervisor(QTS)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		of the problem. Among them are: • Remedy the situation—Contractor corrects deficient work. • Prepare an RFI (Request for Information) with proposed remedy to obtain the intended design purpose. • Design-Related NCR Issue—The DQAM or CQAM will issue the NCR and request design review of the non-conformance. • Price Reduction—for the work element outlined in the contract specifications, the CQAM will perform the calculations in accordance with the contract, obtain written approval from the DM of structural adequacy if applicable, and forward this information to the Project Manager for administrative closure of the NCR. • Remove and Replace—The CQAM may require the CM to remove and replace any non- conforming work. Remediation must have the Employer's concurrence and may require a change order. **Removal of Work** If the Employer does not agree with the remedial actions set forth in an NCR, it has the authority to call for removal of the non-conforming work.		
Crest and Sag Curves	To be designed to Road Note 6 and AASHTO standards.	Manage: • Review Employer's technical requirements in respect of design standards. • Document clarifications of any of the quality requirements, and understandings arrived at with the employer.	As required As required To be done and approved by	Designer, Design Manager, Project Manager Designer, Design Manager Designer

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		• Develop the designer's quality management program which is a written document defining the designers 's processes, practices, and procedures, which are to ensure the project's quality requirement are met or exceeded. Contractor. • Review contract specifications in respect of work quality requirement. • Document clarifications of any of the quality requirements, and understandings arrived at with the designer and/or project owner. • Develop the contractor's quality management program which is a written document defining the contractor's processes, practices, and procedures, which are to ensure the project's quality requirement are met or exceeded.	the project manager and before commencement of designs. As required As required To be done and approved by the project manager and supervision consultant before commencement of construction.	Contractor, Supervisory Consultant, Project Manager Contractor, Supervisory Consultant
		Control: 1. **Prepare Design Documents**. The design team prepares the design documents, using the established design criteria for the project and appropriate inter-discipline and Task Force coordination (via regular scheduled meetings, written communications, etc.). 2. **Check**. All design documents are subjected to in-discipline design checking process. For design documents where inter- discipline design checks are warranted, an Inter-Discipline Design Check (IDC) is performed. The Checker checks the design documents following the procedures detailed in the Employers requirements. 3. **Revise**. Checker corrections and comments and review comments are evaluated and incorporated into the documents by the	To be done continuously through the design process.	Design Quality Assurance Manager (DQAM), Design Manager(DM)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		Originator, as appropriate. 4. **Audit**. The DQAM audits the design documents in accordance with the Employer's requirements and certifies them as meeting the requirements of the QMP (Quality management Plan) 5. **Document Control**. Document Control logs and copies audited design documents, files them in the project files, and transmits electronic versions to the Ministry of Infrastructure and other approved project stakeholders. 6. **Review**. The Ministry, identified team Reviewers, and other approved project stakeholders review the design documents in accordance with the Employer's requirements and document comments. 7. **Comment Resolution Meeting**. The design team, Ministry, and other Reviewers meet following the review to discuss and agree on comments. 8. **Revise**. The design team makes the necessary revisions to the design documents to address the comments as agreed upon and advance the design to the next level. 9. **Repeat check/audit/review/revise cycle** through each required submittal. 10. **Prepare and Audit RFC (Release for Construction) Submittal**. The design team prepares the RFC documents and submits the RFC package to the DQAM. The DQAM audits and certifies the documents indicating that the documents are approved for RFC. The DQAM stamps the documents "Released for Construction". The package is then returned to the DM. 11. **Release for Construction (RFC).** The DM transmits the signed		

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		and sealed RFC Design Documents stamped “Released for Construction” to Document Control along with the DQAM’s certification that the design package may be released for construction. 12. **Document Control**. Document Control logs and copies the audited RFC documents, files them in the project files, and transmits electronic versions to the Ministry and other approved project stakeholders. 13. **Acceptance of Final Design**. The Ministry’s acceptance of the final design occurs after the Ministry’s acceptance of construction.		
Horizontal road alignment.	To be designed and to Road Note 6 and AASHTO standards.	Manage: • Review Employer’s technical requirements in respect of design standards. • Document clarifications of any of the quality requirements, and understandings arrived at with the employer. • Develop the designer’s quality management program which is a written document defining the designers ’s processes, practices, and procedures, which are to ensure the project’s quality requirement are met or exceeded.	As required As required To be done and approved by the project manager and before commencement of designs	Designer, Design Manager, Project Manager Designer, Design Manager Designer
		Control: 1. **Prepare Design Documents**. The design team prepares the design documents, using the established design criteria for the project and appropriate inter-discipline and Task Force coordination (via regular scheduled meetings, written communications, etc.). 2. **Check**. All design documents are subjected to in-discipline design checking process. For design documents where inter- discipline	To be done continuously through the design process.	Design Quality Assurance Manager (DQAM), Design Manager(DM)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		design checks are warranted, an Inter-Discipline Design Check (IDC) is performed. The Checker checks the design documents following the procedures detailed in the Employers requirements. 3. **Revise**. Checker corrections and comments and review comments are evaluated and incorporated into the documents by the Originator, as appropriate. 4. **Audit**. The DQAM audits the design documents in accordance with the Employer's requirements and certifies them as meeting the requirements of the QMP (Quality management Plan) 5. **Document Control**. Document Control logs and copies audited design documents, files them in the project files, and transmits electronic versions to the Ministry of Infrastructure and other approved project stakeholders. 6. **Review**. The Ministry, identified team Reviewers, and other approved project stakeholders review the design documents in accordance with the Employer's requirements and document comments. 7. **Comment Resolution Meeting**. The design team, Ministry, and other Reviewers meet following the review to discuss and agree on comments. 8. **Revise**. The design team makes the necessary revisions to the design documents to address the comments as agreed upon and advance the design to the next level. 9. **Repeat check/audit/review/revise cycle** through each required submittal. 10. **Prepare and Audit RFC (Release for Construction) Submittal**. The design team prepares the RFC documents and submits the		

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		RFC package to the DQAM. The DQAM audits and certifies the documents indicating that the documents are approved for RFC. The DQAM stamps the documents “Released for Construction”. The package is then returned to the DM. 11. **Release for Construction (RFC).** The DM transmits the signed and sealed RFC Design Documents stamped “Released for Construction” to Document Control along with the DQAM’s certification that the design package may be released for construction. 12. **Document Control**. Document Control logs and copies the audited RFC documents, files them in the project files, and transmits electronic versions to the Ministry and other approved project stakeholders.		
Protected Environment	Undertake designs to ensure that project conforms to the Environmental protection act of Saint Lucia.	Manage: • Review Employer’s technical requirements in respect of Environmental safeguards and protection. • Document clarifications of any of the quality requirements, and understandings arrived at with the employer. • Develop the designer’s quality management program which is a written document defining the designers ’s processes, practices, and procedures, which are to ensure compliance with the Environmental Protection Act of Saint Lucia.	As required As required To be done and approved by the project manager and before commencement of designs.	Designer, Design Manager, Project Manager Designer, Design Manager Designer
		Control: 1. **Prepare Design Documents**. The design team prepares the design documents, using the established design criteria for the	To be done continuously through the design process.	Design Quality Assurance Manager (DQAM), Design Manager(DM)

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		project and appropriate inter-discipline and Task Force coordination (via regular scheduled meetings, written communications, etc.). 2. **Check**. All design documents are subjected to in-discipline design checking process. For design documents where inter- discipline design checks are warranted, an Inter-Discipline Design Check (IDC) is performed. The Checker checks the design documents following the procedures detailed in the Employers requirements. 3. **Revise**. Checker corrections and comments and review comments are evaluated and incorporated into the documents by the Originator, as appropriate. 4. **Audit**. The DQAM audits the design documents in accordance with the Employer's requirements and certifies them as meeting the requirements of the QMP (Quality management Plan) 5. **Document Control**. Document Control logs and copies audited design documents, files them in the project files, and transmits electronic versions to the Ministry of Infrastructure and other approved project stakeholders. 6. **Review**. The Ministry, identified team Reviewers, and other approved project stakeholders review the design documents in accordance with the Employer's requirements and document comments. 7. **Comment Resolution Meeting**. The design team, Ministry, and other Reviewers meet following the review to discuss and agree on comments. 8. **Revise**. The design team makes the necessary revisions to the design documents to address the comments as agreed upon and		

Deliverable	Requirement	Manage and Control activities	Frequency	Responsible
		advance the design to the next level. 9. **Repeat check/audit/review/revise cycle** through each required submittal. 10. **Prepare and Audit RFC (Release for Construction) Submittal**. The design team prepares the RFC documents and submits the RFC package to the DQAM. The DQAM audits and certifies the documents indicating that the documents are approved for RFC. The DQAM stamps the documents “Released for Construction”. The package is then returned to the DM. 11. **Release for Construction (RFC).** The DM transmits the signed and sealed RFC Design Documents stamped “Released for Construction” to Document Control along with the DQAM’s certification that the design package may be released for construction. 12. **Document Control**. Document Control logs and copies the audited RFC documents, files them in the project files, and transmits electronic versions to the Ministry and other approved project stakeholders. 13. **Acceptance of Final Design**. The Ministry’s acceptance of the final design occurs after the Ministry’s acceptance of construction.		

4.5.6 Quality documents

1. Checklists.

These are used to establish things to do to ensure for example compliance with procedure. A sample is given below (***Source-MSDGC Contractor QC Plan***)

Initial Inspection Checklist			
Project Name:			**Project Number:**
WORK ACTIVITY:			
Date:	**Sheet:**	**Spec. Section:**	**Page: ___ of**

No.	**Item**	**Yes**	**No**	**N/A**
1	Was the production foreman present?			
2	Material			
a)	Were materials inspected for compliance?			
b)	Were corrective actions taken for defective material?			
c)	Were corrective actions appropriate?			
d)	Were any deviations accepted?			
3	Installation Requirements			
a)	Did work comply with specifications or plans?			
b)	Was workmanship satisfactory?			
c)	Were corrective actions appropriate?			
d)	Were any deviations accepted?			
4	Tests			
a)	Were tests being performed?			
b)	Was testing frequency satisfactory?			
c)	Were test samples or locations appropriate?			
d)	Was testing quality coordinated with			
5	Inspections			
a)	Was inspection done by the QC Inspector in the Prep.			
b)	Was the inspection frequency as established in the			
c)	Were critical inspections satisfactory?			
d)	Was the inspection satisfactory?			
6	Safety			
a)	Was the safety officer present?			
b)	Were the safety requirements followed?			
c)	Were the safety requirements modified?			

Initial Inspection Checklist			
Project Name:			**Project Number:**
WORK ACTIVITY:			
Date:	**Sheet:**	**Spec. Section:**	**Page: ___ of**
Remarks (explanations required for "No" responses and if deviations were accepted):			
Reported by: (Quality Control Inspector)	Reviewed by: (Quality Control Manager)	Reviewed by: (Quality Assurance Representative)	

2. Audits.

A quality control plan audit for a construction project is the "check" part of the "Plan-Do-Check-Act" (PDCA) process. The purpose of the audit is to see whether your quality plan is working as intended.

A simple audit checklist is given below (***Source: firsttimequality.com***)

Quality System Audit Checklist

YES NO Project Quality Coordination and Communication

☐ ☐ A project start up meeting was conducted to communicate project goals and expectations.

☐ ☐ Before each scheduled work task, a preparatory meeting was conducted to communicate requirement details and coordinate work activities.

YES NO Employee Qualifications

☐ ☐ Employee qualifications were evaluated based on previously identified requirements including licensing requirements, training qualifications, responsibilities, and authority for each job position.

☐ ☐ Field employees were trained on quality standards and procedures for their job position.

☐ ☐ Employee capabilities were validated before employees were assigned to carry out quality job responsibilities.

YES	NO	
☐	☐	Employee qualifications, quality practices, and performance are being reviewed on an ongoing basis as part of the employee performance management process.
YES	NO	Qualification of Subcontractors and Suppliers
☐	☐	Outside organizations' qualifications were verified based on licensing requirements, compliance with specific quality standards, quality responsibilities, qualification of personnel and quality improvement processes.
☐	☐	Subcontractor and supplier quality performance is being evaluated on an ongoing basis.
YES	NO	Project-Specific Quality Standards
☐	☐	All relevant regulations, codes, and industry standards are available on jobsite.
☐	☐	Specifications for materials that meet contract as well as regulatory requirements are available on jobsite.
☐	☐	Quality and certification requirements for materials and equipment that affect quality are available on jobsite.
☐	☐	Measuring devices that affect quality were calibrated to special requirements when applicable.
☐	☐	Contract and published standards were supplemented with company quality standards as required to reduce quality risks and assure quality results.
YES	NO	Inspections and Test Plan
☐	☐	Inspections and tests were performed to contract specifications and industry standards.
☐	☐	Inspection and test results were recorded for each quality inspection and test.
☐	☐	Inspection and test samples were sent to independent laboratories that are certified by nationally recognized accreditation agencies.
YES	NO	Work Task Quality Inspections
☐	☐	Required quality work task inspections were performed at key milestones during the project.
☐	☐	All quality inspections and quality control activities were performed for each work task as required by the contract, industry, and company policies.
☐	☐	The full series of quality inspections (including before work begins, at first article completion, while work is in process, and at completion) were performed for each construction task.
☐	☐	All materials were inspected before use.
☐	☐	The results of each work task inspection were recorded. A copy of the inspection report is available for review.

YES NO Quality Control of Corrections and Non-conformance

- ☐ ☐ non-conformance and rework items were marked clearly to identify them for correction.
- ☐ ☐ Corrections were made in a timely manner and validated for their effectiveness.
- ☐ ☐ Customer approval was received before accepting any nonconforming items.
- ☐ ☐ Non-conformance items were noted for future prevention.
- ☐ ☐ Standards and specifications were updated to address the causes of non-conformance.
- ☐ ☐ A review was done of the effectiveness of actions that were taken to prevent non-conformance.

YES NO Project Completion Inspections

- ☐ ☐ Senior managers, independent of production, performed a rigorous inspection at project completion.
- ☐ ☐ All deviations were corrected and re-inspected prior to submittal to the customer for final review.
- ☐ ☐ Management participated in the customer's final inspection and quickly addressed issues that were found.

3. **Quality assurance documents such as Project Quality Plan (PQP) or Quality Assurance Plan (QAP), Inspection Test Plans (ITPs), Job Procedures (JPs), Project Specifications etc.**

4.5.7 Continuous Improvement Plan

Process Description
1**. Diagnostic of current situation.** The first step of the methodology starts with the observation, data gathering, and data processing of the construction process, i.e., resources and information flows, waste conversion activities and management of flows and conversion processes. The aim is to obtain the most complete and accurate picture of what is happening in the project.
2**. Information Review.** After all the necessary information has been gathered, this is reviewed with the aim of achieving the following objectives: • Obtain a clear and comprehensive understanding of every aspect related to the project construction process under study. • Identification of waste, including non-

Process Description
value-adding activities. • Identification of management and organizational deficiencies. • Identifying possible causes of waste and deficiencies and selecting the most important ones. • Identifying immediate (and sometimes obvious) improvement opportunities easy to implement.
3. **Analysis and identification of improvement opportunities.** Once the identification of quality issues has been accomplished, the next step is to find out cost effective improvement opportunities that can be applied to improve quality, productivity and reduce waste. This analysis is performed using teamwork and brainstorming among the members of the team.
4. **Definition and evaluation of improvement strategies and actions.** After selecting the most promising improvement opportunities, a set of improvement strategies and actions is identified for each one, again using teamwork. An initial selection is performed to reduce the number of alternative solutions. Each selected improvement strategy and action is evaluated in terms of: technical feasibility, economic feasibility, time feasibility, cost of implementation, and associated benefits of its implementation. As a result of this evaluation, the feasible and most profitable strategies and actions are selected for implementation. Also, a goal is set and a performance measurement is selected for each one to be used during and after implementation, to check if the desired level of improvement is actually achieved.
5. **Planning of implementation of Improvement Strategies.** The most difficult step of the improvement methodology is the implementation of improvement strategies and actions. The most important factor of the implementation plan is to consider the way that resistance barriers of the personnel will be overcame. Then it is critical to ensure that implementation is understood and accepted by all the people that will be affected by changes.
6. **Monitoring and evaluation of obtained results.** This stage is used to determine the results obtained from implementation, using selected

Process Description
performance measures for each improvement action. The focus at this stage is to review the actual improvements achieved by implementation, the difficulties faced during implementation, and the reasons that precluded improvement or reduced the expected gains.
7. **Corrective actions and maintenance of changes to assure benefits.** According to results obtained in the previous stage, corrective actions considered necessary to make the implementation more effective are adopted in this stage. A second aim of this stage is to assure the maintenance of the implemented changes, to assure the short and long-term benefits expected from them.

The FAARP II project forms part of the Government of Saint Lucia's Public Sector Investment Program. Funding is being provided by the Caribbean Development Bank. Because of its high-profile nature this project is expected to be under a lot of scrutiny. Hence it is imperative that a good and detailed Quality Management Plan is in place for this project.to ensure that the overarching requirements of the project are met.

The requirements listed below include the quantified and documented needs and expectations of the Sponsor-Department of Infrastructure, Ports and Energy, Customer-the driving public as represented by the National Minibus Association and the National Taxi Association, and other stakeholders-CDB, Line Ministries, Town and Village Councils, etc.

1.Reduced vehicle operating cost.
2.Improved ride-quality
3.Reduced unemployment
4.Improved touristic facilities
5.Environmentally compliant
6. Reduced travel time.

7.Reduced accidents.

The developed Quality plan seeks to ensure that at the end of the day the Employer gets value for money. To ensure effectiveness of the plan it is necessary that the Department of Infrastructure engage all stakeholders in the endorsement of this plan. Buy in and support from all stakeholders is key to project success. It will serve the Department well to conduct regular Audits of the plan to ensure compliance and to identify any areas that can be improved upon.

4.5.8 Approval

Approved by:

_____ Date:_____

Permanent Secretary-DIPE

Sponsor

_____ Date:_____

Chief Engineer-DIPE

Project Manager

4.6 Human Resource Management Plan

4.6.1 Introduction

The purpose of the FAARPII-Package 1 Human Resource Plan is to achieve project success by ensuring the appropriate human resources with the necessary skills are acquired, resources are trained if any gaps in skills are identified, team building strategies are clearly defined, and team activities are effectively managed. This plan will serve as a tool to aid in the management of human resource activities throughout the FAARP II-Package 1 until closure.

This plan includes information regarding the following:

- Roles and responsibilities of team members throughout the project
- Project organization charts
- Staffing management plan to include:
    a. How resources will be acquired
    b. Timeline for resources/skill sets
    c. Training required to develop skills
    d. How performance reviews will be conducted
    e. Recognition and rewards system

4.6.2 Roles and Responsibilities

Project Team Roles and Responsibilities

Listed below are the roles and responsibilities for the FAARPII-Package 1 project team:

Project Manager (Chief Engineer)

- Plans, directs and oversees the project, and ensures that deliverables and functionality are achieved as defined in the Project Charter, funding documentation, and subsequent project plans
- Maintains accountability for the management of all resources assigned to the project

- Serves as the primary liaison between the project and the Project Sponsor and the Steering Committee
- Monitors consultant performance and ensures that the consultant maintains quality control
- Plans, monitors, and evaluates consultant, problem reporting, and resolution processes

Project Engineer

- Responsible for quality assurance of the project design.
- Responsible for design development and quality control of the design work.
- Maintains the requirements management traceability matrix
- Provides insight into project health by reviewing process and product activities for adherence to standards and plans

Design Engineer

- Responsible for the design review of the project designs in conformity with the employer's requirements.

Traffic Engineer

- Under the Design Review component of the project is responsible for the review and update of all traffic data necessary for working out the pavement design loads and operational protocol of the road.

Engineering Surveyor

- Responsible for all pertinent civil engineering survey data to facilitate the review of the vertical and horizontal alignment design details and verify all setting out information.

Materials Engineer

- Under the Design Review component of the project is responsible for the review of all materials data, updating all available data and finalizing the materials quality assurance plan for the project.

Utilities Engineer

- Under the Design Review component of the project is responsible for finalizing all details pertaining to Utilities relocation and requirements of the Utility companies affected by the works.

Quantity Surveyor

- Responsible for cost review as per the Design Review process
- During supervision is responsible for cost control, quantities measurements, rates review and adjustments, preparation of payment certificates and audits.

Design Team Leader

- Responsible for managing all aspects of the Design Review effort.

Design Review Technicians

- Responsible for providing support to the Design Review team.

Resident Engineer

- Manages day-to-day activities of technical staff who are engaged in the Supervision of works aspect of the project
- Leads in the technical disciplines of the project unlike the Project Manager who will focus on the overall project management of the project
- Partners with other areas to acquire appropriate technical assistance for such areas as, testing, configuration management, change management, release management, and other technical areas of the project.
- Provides leadership and support to technical staff that are augmented to the project throughout the works implementation and project closeout phase of the project.
- Provides technical support to the project manager to establish and execute technical policies, processes, and procedures
- Manages for the implementation portion of the project
- Provides implementation management leadership through planning, organizing, coordinating, and monitoring implementation activities

- Effectively manages all information technology resources assigned by the project manager
- Interfaces directly with contractors to ensure technical obligations satisfy all objectives and expectations
- Coordinates all testing by working with the Quality Management staff.
- Coordinates interface with Utility Companies and Government Agencies as needed
- Monitors contractor management of operations and resolution of operations support problems.

Works Technicians

- Assist the Resident Engineer in the supervision of the works component of the project.

4.6.3 Project Stakeholders Roles & Responsibilities

Listed below are the roles and responsibilities for the FAARPII-Package 1 project stakeholders:

Project Sponsor

- Provides vision, direction, and policy leadership for the project
- Assists in removing barriers and supports change management initiatives
- Participates in the Steering Committee, and provides support to this group as needed
- Has overall authority for the project
- Responsible for ensuring that deliverables and functionality are achieved as defined in the Project Charter and subsequent project plans

Steering Committee

- Acts as the Project stakeholders**'** group

- Ensures that the deliverables and functionality of the project are achieved as defined in the project initiation documents and subsequent project management plans
- Provides high-level project direction, receives project status updates, and addresses and resolves issues, risks, or change requests

Department of Infrastructure Materials Laboratory

- Provides independent, technical review and verification of project deliverables, as well as independent testing and auditing of project deliverables against requirements
- Performs deliverable quality assurance and information

Ministry of Finance

- Provides oversight and approval of funding for state planned construction projects

4.6.4 Project Organizational Charts

The graphic below provides a representation of the reporting structure for FARRPII-Package 1.

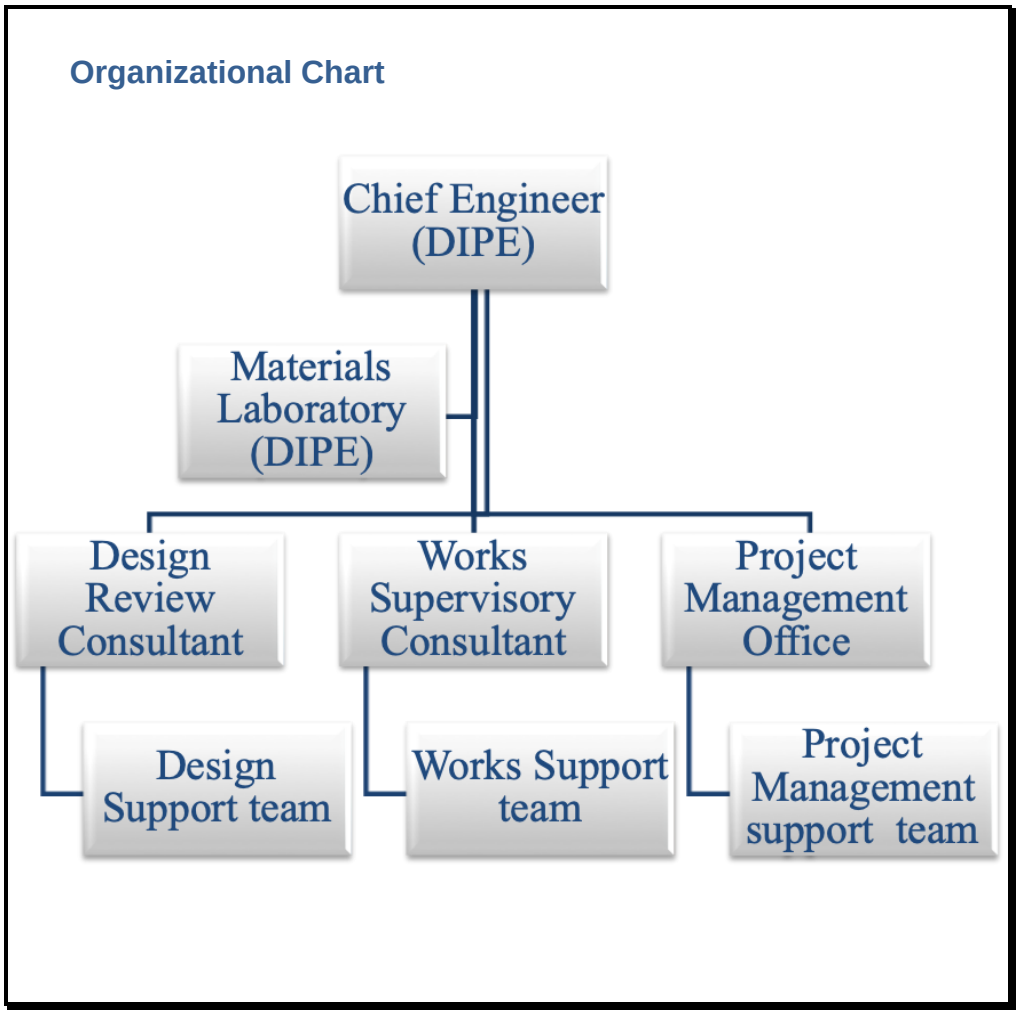


Figure 34.Reporting Structure for FAARP II (Source A. Jn. Baptiste, 2019)

The following RACI chart shows the relationship between project tasks and team members. Any proposed changes to project responsibilities must be reviewed and approved by the Project Manager. Changes will be proposed in accordance with the project's change control process. As changes are made, all project documents will be updated and redistributed accordingly.

Chart 38. RACI Matrix (Source: A. Jn. Baptiste, 2019)

Roles	Procurement-Design Review	Design Review and Tender document preparation	Procurement-Works Contractor	Works Supervision	Quality Testing	Conduct Training	Stakeholder Communication Management
Project Manager	**R**	**A**	**R**	**C**	**I**	**R**	**R**
Team Leader -Designs	**-**	**R**	**C**	**-**	**-**	**-**	**-**
Project Engineer	**I**	**C**	**I**	**A**	**A**	**C**	**C**
Quantity Surveyor	**-**	**C**	**C**	**C**	**-**	**-**	**-**
Materials engineer	**-**	**C**	**-**	**-**	**-**	**-**	**-**
Engineering Surveyor	**-**	**C**	**-**	**-**	**-**	**-**	**-**
Traffic Engineer	**-**	**C**	**-**	**-**	**-**	**-**	**-**
Utilities Engineer	**-**	**C**	**-**	**-**	**-**	**-**	**-**
Design Review Technicians	**-**	**C**	**-**	**-**	**-**	**-**	**-**
Resident Engineer	**-**	**-**	**-**	**R**	**R**	**C**	**I**
Work Supervision Technicians	**-**	**-**	**-**	**C**	**C**	**C**	**-**
Project Sponsor	**C**	**C**	**C**	**-**	**--**	**I**	**I**
Steering Committee	**A**	**I**	**A**	**I**	**-**	**A**	**A**
Materials Laboratory	**-**	**C**	**-**	**C**	**C**	**-**	**-**
Agency Subject Matter Experts	**C**	**C**	**C**	**-**	**C**	**-**	**C**

Key:

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

4.6.5 Staffing Management

Day-to-day management of the project staff for FAARPII-Package 1 is the responsibility of the project manager. Performance evaluations, performance issues and recognition, promotions, and disciplinary actions are the responsibility of the Human Resource Officer of the Department of Infrastructure.

Staff Acquisition

The project manager, with support from the Sponsor, will negotiate with functional and department managers to identify and assign resources in accordance with the project organizational structure. This plan shall also identify various external sourcing mechanisms to hire new project resources. All resources and their anticipated project assignment timeframe must be approved by the appropriate functional/department manager before the resource may begin any project work. The project team must be co-located at the FARRPII-Package 1 site.

Resource Calendars

The FARRPII-Package 1 will last for 516 days. The resources required are detailed in the Activity Resource Chart in the Cost Management Plan.

Vendor/State Partnering Approach

For FAARPII-Package 1 the team will implement a model in which the agency project team is expected to work side by side with the design and supervisory consultants to deliver the project. This partnership will facilitate the training & knowledge transfer process to prepare the agency project team to sharpen project manage skills and ensure capacity building.

Though contractors are important and are used to implement construction projects in Saint Lucia, the State has responsibility for overall review and approval for work produced by contractors. Additionally, knowledge transfers of contractor expertise

to DIPE staff is required on all projects throughout the project lifecycle, rather than waiting to transition information at project closure.

4.6.6 Project Team Training

Staff Training

When new staff joins the project, the project manager will provide project orientation. The orientation will include discussions related to the following topics:

- Background of the Project
- Current Status of the Project
- Specific Job Duties and Expectations
- Introduction to the Staff and Consultants
- Overview of the Facility and Infrastructure
- Overview of the Project Processes, including time reporting, attendance, and status meetings

Performance Reviews

The Project Manager will review each team member's assigned work activities at the onset of the project and communicate all expectations of work to be performed. The project manager with the assistance of the Human Resource Officer will then evaluate each team member throughout the project to determine their performance and how effectively they are completing their assigned work. Prior to releasing project resources, the project manager will meet with the appropriate source Unit manager and provide feedback on employee project performance.

Recognition and Rewards

Although the scope of this project does not allow for monetary rewards, there are several planned recognition and reward items for project team members. The project manager will work with the Human Resource Officer to identify potential opportunities and tools for creative recognition and rewards.

Upon successful completion of the project, any team member who satisfactorily completed all assigned work packages in a timely manner will receive special recognition from the Permanent Secretary and Minister of Infrastructure, Ports Energy and Labor. A report of satisfactory performance will be placed on their personal file for future reference.

4.6.7 Acceptance

Approved by:

_____ Date:_____

Permanent Secretary-DIPE
FARRPII-Package 1 Executive Sponsor

_____ Date:_____

Permanent Secretary-Ministry of Finance
FARRPII-Package 1 Financial Sponsor

_____ Date:_____

Chief Engineer-DIPE
FARRPII-Package 1 Project Manager

_____ Date:_____

Human Resource Officer-DIPE
FARRPII-Package 1 Stakeholder

4.7 Communications Management Plan

4.7.1 Introduction

With the project, entering the design review phase there will be enhanced visibility of the project, which will invariably attract attention across the broad spectrum of “affected stakeholders and interest groups”. While the Construction phase presents an opportunity to pervade the market with positive messages that encourage buy-in, the actual construction by its nature also brings in risk factors such as labour issues, traffic disruptions, quality delivery, cost escalations and site incidents that could derail or cast a negative light on the project.

Keeping all relevant stakeholders especially the public, and those directly affected by the construction in the know is of critical importance not only in fostering cooperation and buy-in but also in terms of promoting the overall project.

The Construction Communication Plan has taken into consideration the overall Communications and Marketing Plan, communication risk factors and the infrastructure construction and roll-out plan. In so doing, the construction communication strategy and plan will seek to ensure that information regarding the infrastructure roll out is optimally communicated in a manner that not only serves the core objective of keeping stakeholders informed but also promotes the project and helps to minimize the communication risk factors associated with the infrastructure roll out especially from a traffic and business access disruption standpoint.

The Construction Communication Strategy and Plan will mirror the infrastructure construction roll out and will be updated and adapted throughout the full period.

Project communication is the exchange of project-specific information with the emphasis on creating understanding between the sender and the receiver. Effective communication is one of the most important factors contributing to the success of a project.

The project team must provide timely and accurate information to all stakeholders. Members of the project team prepare information in a variety of ways to meet the needs of project stakeholders. Team members also receive feedback from these stakeholders.

Project Communication Management is the knowledge area that employs the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information and as such Project Communication is the responsibility of everyone on the FAARPII project team.

Communication is important to the success of the FAARP II. Construction projects are fairly complicated in their communications requirements and hence it is necessary that a communications management plan be formulated that addresses all needs. Figure 34 below gives an indication of the complexity of the of the communications network associated with FAARPII.

The *PMBOK Guide* states that Project Communications Management ensures timely and appropriate generation, collection, distribution, storage retrieval, and ultimate disposition of project information. This Knowledge Area is very important in the design and construction of FAARPII because of the number and diversity of key players and the need to communicate information in a timely and accurate way.

Along all the phases of the project life cycle, important information will have to be generated, collected, and distributed between the project team members and other stakeholders. Communications methods and protocols should be planned as part of effective project management practice. The various construction organizations involved as part of the supply chain should accept and agree on planned communication protocols for the project.

In planning the construction project's communications, important consideration should be given to the contract documents. These include the contract, the general and special conditions, and the design documents and any referenced

documents that indicate specific records and/or contemporaneous documentation and reporting requirements. These items should be generated and managed for the duration of the project. Since these documents are not yet available it is understood that the plan will be updated as these become available and are approved.

A key aspect of the communications management strategy are daily reports. Daily reports, daily field reports, or daily construction reports are daily records of factual information regarding the worksite conditions and events, including among others:

- Weather and site conditions;
- Workmen, contractor, and subcontractor personnel employed;
- Equipment arrival, departure, and downtime; Project activity;
- Progress of work;
- Resources used to complete activities;
- Significant communications, orders, directives, and documents;
- Safety and environmental accidents, breakdowns, injuries, delays, damages, and other unusual events;
- Significant visitors;
- Tests and inspections;
- Traffic control; and
- Safety.

Daily reports are essential documents in construction projects and can be extremely important for dispute resolution hence due care must be taken to ensure that proper records are kept and that these are adequately disseminated

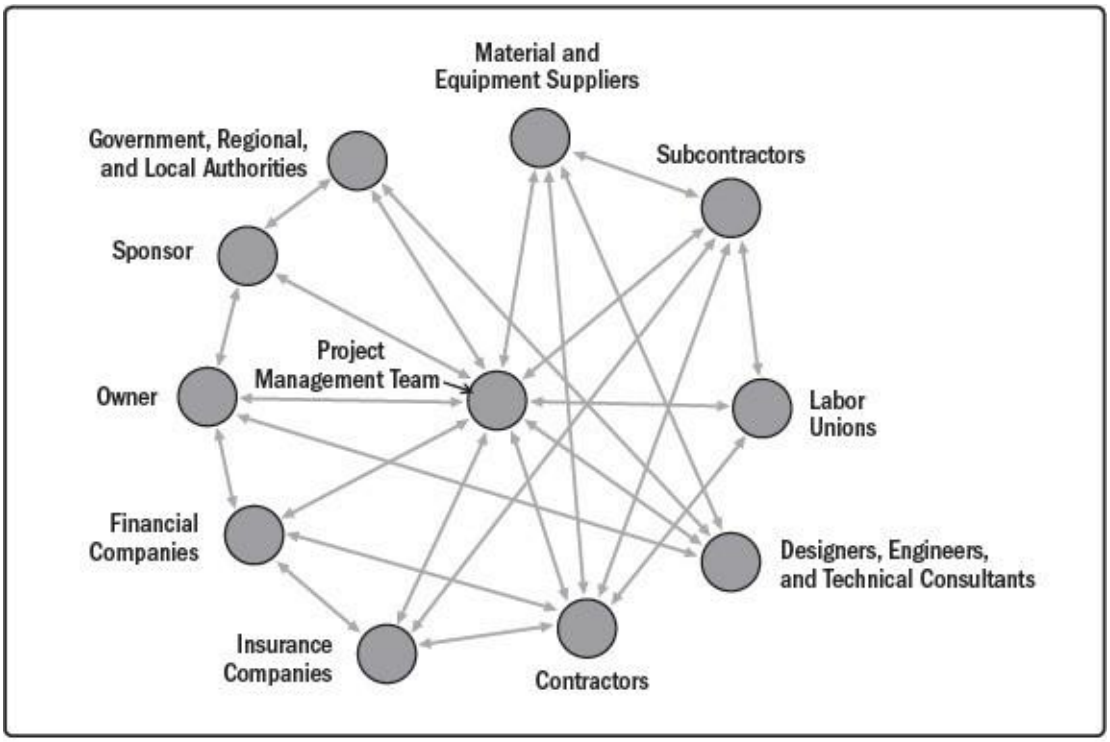


Figure 35. Construction Communication Network (Source: Project Management Institute, 2016)

4.7.2 Purpose of Communication Management Plan

The purpose of the Communications Management Plan is to define the communication requirements for the project and how information will be distributed. The Communications Management Plan defines the following: what information will be communicated; how the information will be communicated (in meetings, email, telephone, newsletter, web portal, etc.); when information will be distributed; who is responsible for communicating project information; how any sensitive or confidential information is communicated and who must authorize this; any constraints, internal or external, which affect project communications; and any standard templates, formats, or documents the project must use for communicating. This Communications Management Plan sets the communications framework for the FAARPII. It will serve as a guide for communications throughout the life of the project and will be updated as communication needs change. This plan identifies and defines the roles of persons involved in this project.

The project manager is responsible to monitor and manage the communications as part of the project management activities of the project.

4.7.3 Communication Management Approach

In FAARPII and more specifically Package 1, the cooperative and open communication approach will be used. One of the major goals of the FAARPII is to share knowledge and exchange information. Therefore, the required infrastructure to enable open channels of communication between all the project partners will be provided. This approach will direct the activities throughout the project and it will also create a sustainable project for the future.

We will use multiple communication channels to exchange ideas, information, and reports. We will use electronic media such as emails, Skype conversations, video-conferences, in order to provide synchronous conversations while keeping expenses as low as possible. In addition, we will use telephone conversations and meetings to create interactive relations between the partners. The project manager will take a proactive role in ensuring effective communications on this project.

As with most project plans, updates or changes will be required as the project progresses or changes are approved. Changes or updates may be required due to changes in personnel, scope, budget, or other reasons. Additionally, updates may be required as the project matures and additional information is available. The project management team is responsible for managing all proposed and approved changes to the communications management plan. Once the change is approved, the project management team will update the plan and supporting documentation and will distribute the updates to the project team and all partners and stakeholders.

The following chart (Chart 39) presents contact information for FAARPII-Package 1. The mail addresses in this table will be used to communicate with these people. Phone numbers will be added as this table is refined. In addition, an updated contact list that includes all the personnel involved in the FAARPII –Package 1 will be made available on the Government Website.

Chart 39. Key project team directory (Source: A. Jn. Baptiste, 2019)

Country	Institution	First name	Last name	Short Name	Function	Email
Saint Lucia	DIPE	Albert	Jn Baptiste	AJB	Project Manager	eipem1@gmail.com
Saint Lucia	DIPE	Kohan	Dolcy	KH	Project Engineer	kohdolcy@gosl.gov.lc
Saint Lucia	DIPE	Ivor	Daniel	ID	Permanent Secretary	ps.infrastructure@gosl.gov.lc
Saint Lucia	Ministry of Finance	Cointhia	Thomas	CT	Permanent Secretary	ps.finance@gosl.gov.lc
Saint Lucia	Ministry of Agriculture	Barrymore	Felicien	BF	Permanent Secretary	ps.agriculture@gosl.gov.lc
Saint Lucia	Ministry of Economic Development	Claudius	Emmanuel	CE	Permanent Secretary	ps. economicaffairs@gosl.gov.lc
Barbados	Caribbean Development Bank	Sharon	Griffith	SG	Projects Officer	s.griffith@caribank.org
TBD	Design Consultant	TBD	TBD	DC	Team leader	TBD
					Traffic engineer	TBD
					Engineering Surveyor	TBD
					Materials Engineer	TBD
					Utilities Engineer	TBD
					Quantity Surveyor	TBD
Saint Lucia	Contractor	TBD	TBD	CON	TBD	TBD
TBD	Supervisory Consultant	TBD	TBD	SC	Resident engineer	TBD
					Quantity Surveyor	TBD
Saint Lucia	DIPE	Bernard	St. Cyr	BSC	Head of Materials Laboratory	b.st.cyr@gosl.gov.lc

4.7.4 Communication Methods and Technologies

Project team members will use a variety of communication methods to deliver project information, including meetings, telephone calls, email, voicemail, and websites. Meetings in particular are often the most effective way to distribute information to project stakeholders. Before planning a meeting, the project manager or assigned team member will consider the communication objectives carefully and choose a meeting format that will meet the objectives.

FAARP II will use the Government website to provide updates, archive various reports, and conduct project communications. This platform enables the project management team, as well as authorized stakeholders, to access project data and communications at any point in time. However, this website does not provide the ability for stakeholders and project team members to collaborate on project work and communication.

Chart 40. Communication methods (Source: A. Jn. Baptiste, 2019)

Method	Purpose	Responsibility	Frequency	Audience
Project Management Committee Meetings.	Making key decisions for realization of project activities and financing. Reporting current project status. Communicate all changes. Identify milestones. Identify and discuss project	Project Manager	Once per month	Project Management team
Project progress meetings	Ensuring realization of project activities by players. Identify and discuss project issues and corrective actions.	Project Manager	Bi weekly	Design Consultants / Supervisory Consultant / Contractor
Office meeting	Report status and progress of projects and scheduled tasks.	Project Engineer	Ad hoc	Staff involved in the project from the partners
External meetings	Involve external partners in the project. Stakeholder issues.	Project Manager	As needed	Concerned stakeholders
Government website	Report status and progress of scheduled milestones and activities. General project information.	Webmaster	As needed every two weeks of the project lifetime	The general public
Correspondence (letters, memos, email, skype, etc)	Document status of action items, decisions made, and problems encountered.	All project partners	As needed	All project partners
Site visit	In accordance with project activities. Identify and discuss problems and solutions for project obstacles. Identify project status and recommendation for improvement	Project manager and internal/ external Auditors	As needed	All project partners
Town hall meetings	Engage the local community to present the designs for feedback Engage the local community for continuous feedback during construction	Project Manager	As needed	Community Members

Chart 41. Stakeholders (Source: A. Jn. Baptiste, 2019)

Stakeholder Name(s)	Role	Responsibility	#	Stakeholder Information Requirements	Timeframe/Frequency/ Trigger
SG	Sponsors	Provide resources to enable project, provide high level requirements and overall approval for the project and results	1.	Receive written project updates	Monthly
			2.	Provide input to requirements	Prior to completion of significant project milestone / functionality (as directed by the Project Manager)
			3.	Receive recommendations and provide feedback	Upon completion of significant project milestone / functionality (as directed by the Project Manager)
AJB	Project Management	Coordinate overall project activities	4.	Receive update on project progress	Weekly and ad hoc as needed
			5.	Provide updated schedule to team members	Weekly
			6.	Direct communications with project work team	Ad hoc as needed
KD	Project Engineer	Provide day-to-day project direction and requirements	7.	Receive update on project progress	Weekly and ad hoc as needed
			8.	Provide input to requirements	Weekly and ad hoc as needed
			9.	Direct communications with project work team	Weekly and ad hoc as needed
Various	Project work Team Members (Design Review Consultants, Contractor, Supervisory Consultant, Project Engineer, Head of Materials Laboratory)	Implement project	10.	Provide and receive updates on project progress	Weekly
			11.	Direct communications with work team	Weekly and ad hoc as needed

Stakeholder Name(s)	Role	Responsibility	#	Stakeholder Information Requirements	Timeframe/Frequency/ Trigger
BSC	Head of Materials Laboratory	Quality Testing	12.	Provide and receive updates on project progress	Weekly
			13.	Direct communications with tech team	Weekly and ad hoc as needed
ID	Project Owner	Approve and take over project	14.	Receive written project updates	Monthly and ad hoc as requested
			15.	Provide input to requirements	Prior to completion of significant project milestone / functionality (as directed by Project Manager)
			16.	Receive recommendations and provide feedback	After completion of significant project milestone / functionality (as directed by the Project Manager)
SC	Work Supervision	Represent interest of DIPE	17.	Provides update on project progress	Weekly and ad hoc as needed
			18.	Provide input to requirements	Weekly and ad hoc as needed
DC	Design Review	Co-ordinate with Project Manager to determine DIPE requirements and undertake the necessary review of FAARPII designs against the requirements	19.	Provide updates on project progress	Weekly
			20.	Direct communications with stakeholders during Design review stage	Weekly and ad hoc as needed
Site Technicians	Site supervision	Work under the direction of the Supervisory Consultant	21.	Provide daily reports	Daily

4.7.5 Communication standards

Standardization is a proven way to simplify the complexities of project management communications. The FAARPII partners will use standard templates for the various communication tools used throughout projects.

In addition to standard templates and/or formats, the FAARPII team use the Government of Saint Lucia's website as a standard platform from which to share information. It is expected that standardization will provide a level of simplicity to communication platforms and improve effectiveness and efficiency.

For this project, the partners will utilize standard formats and templates for all formal project communications. These will be made available through the project management office.

Chart 42. Communications Matrix FAARPII-Package 1 (Source: A. Jn. Baptiste, 2019)

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable	Format
Kick-off Meeting	Introduce the project team and the project. Review project objectives and management approach.	• Face to Face	Once	• Project Sponsor • Project Team • Stakeholders	Project Manager	• Agenda • Meeting Minutes	• Soft copy archived on project SharePoint site and project web site
Project Team Meetings	Review status of the project with the team.	• Face to Face • Conference Call	Weekly	• Project Team	Project Manager	• Agenda • Meeting Minutes • Project schedule	• Soft copy archived on project SharePoint site and project web site
Technical Design Meetings	Discuss and develop technical design solutions for the project.	• Face to Face	As Needed	• Project Technical Staff	Technical Lead	• Agenda • Meeting Minutes	• Soft copy archived on project SharePoint site and project web site
Monthly Project Status Meetings	Report on the status of the project to management.	• Face to Face • Conference Call	Monthly	• PMO	Project Manager	• Slide updates • Project schedule	• Soft copy archived on project SharePoint site and project web site
Project Status Reports	Report the status of the project including activities, progress, costs and issues.	• Email	Monthly	• Project Sponsor • Project Team • Stakeholders • PMO	Project Manager	• Project Status Report • Project schedule	• Soft copy archived on project SharePoint site and project web site

4.7.6 Guidelines for Meetings

Meeting Agenda

Meeting Agenda will be distributed within 2 business days in advance of the meeting. The agenda should identify the presenter for each topic. The first item in the agenda should be a review of action items from the previous meeting.

Meeting Minutes

Meeting Minutes will be distributed within 5 business days following the meeting. Meeting minutes will include the status of all items from the agenda along with new action items.

Action Items

Action Items are recorded in both the meeting agenda and minutes. Action items will include both the action item along with the owner of the action item. Meetings will start with a review of the status of all action items from previous meetings and end with a review of all new action items resulting from the meeting. The review of the new action items will include identifying the owner for each action item.

Meeting Facilitator

The Facilitator is responsible for distributing the meeting agenda, facilitating the meeting and distributing the meeting minutes. The Facilitator will ensure that the meeting starts and ends on time and that all presenters adhere to their allocated time frames.

Note Taker

The Note Taker is responsible for documenting the status of all meeting items, and taking notes of anything else of importance during the meeting. The Note Taker will give a copy of their notes to the Facilitator at the end of the meeting as the Facilitator will use the notes to create the Meeting Minutes.

4.7.7 Communication Escalation Process

As issues or complications arise with regards to project communications it may become necessary to escalate the issue if a resolution cannot be achieved within the project team. Project stakeholders may have many different conflicting interests in a given project. While escalations are a normal part of project management, there must a documented process that defines how those escalations will take place. This will be developed by the Project Manager using the template below.

Chart 43. Communication Escalation Template (Source: A. Jn. Baptiste,2019)

Priority	Definition	Decision Authority	Timeframe for Resolution

For construction communication to be effective, the golden rules to be followed include:

- Ensure the overall roll out and envisaged timeframes are outlined up-front to all stakeholders: This enables stakeholders to not only get an appreciation and understanding of the project but allows them to structure and plan long-term contingencies on their part.
- Communicate disruptions clearly and timely: This allows for short term implementation of contingency measures by affected parties.
- Communicate general progress regularly: This not only keeps all stakeholders in the loop and promotes transparency but also lends credibility to the project. An added benefit of regular progress updates also enables stakeholders to map out and adjust their contingency plans accordingly and most importantly helps to manage expectations and minimize project disgruntlement backlash risk.

4.7.8 Sponsor Acceptance

Approval

Approved by the Project Owner: Date:

Permanent Secretary

4.8 Risk Management Plan

4.81 Introduction.

This Risk Management Plan defines how risks associated with FAARPII-Package 1 will be identified, analysed, and managed. It outlines how risk management activities will be performed, recorded, and monitored throughout the lifecycle of the project and provides templates and practices for recording and prioritizing risks.

The Risk Management Plan was created by the project manager and will be monitored and updated throughout the project. The intended audience of this document is the project team, project sponsor and management.

The Risk Management Plan was undertaken using the Plan Risk Management process as identified by the PMBOK® Guide Sixth Edition (2017), with the project charter, assumption analysis, expert judgment, analog data and the stakeholders being the source for the identification and evaluation of the risks. Four (4) areas of risks were identified in the Risk Breakdown Structure (RBS); Technical Risks, Management Risks, External Risk and Commercial Risks which were further subdivided into individual and overall project risk. In planning the risk responses, the Project Manager undertook the plan risk process which involved the selection strategies and determining actions to address individual project risks. The risk responses vary from mitigation to transfer and provide a framework for the effective management of the negative (threats) risks. No opportunities have been identified for this project up to this point in time. It must be pointed out that what has been developed is only preliminary and further elaboration will be undertaken as the project progress. As the project is rolled out any identified opportunities will be dealt with as per standard risk response strategies for opportunities: exploiting, improving, keeping or sharing or accepting.

Provisions are made in the Risk Management Plan for Project Management Plan/Document Updates which capture any required changes to Project Charter or

other baseline documents. All changes will go through the change control process and approvals will be needed for any new risks that has been recognized. There are also provisions for Risk Monitoring and Risk Mitigation and Avoidance.

Specific objectives of the FAARPII-Package 1 Risk Management Plan include:

- Ensure critical risks impacting scope, schedule, budget, project performance, and/or change management are proactively identified, communicated, mitigated, and escalated in a timely manner.
- Facilitate attention to key risks impacting the project and individual teams.
- Produce meaningful information that allows project management to focus efforts on the “right” (e.g., high likelihood and high impact) risks with an effective coordination of effort.
- Ensure appropriate stakeholders are informed and, if applicable, participate in the mitigation.
- Record an audit trail of discussions and mitigation of project risks.

The Risk Manager (Project Manager in this case or his designate) is responsible for the Risk Management Plan, its effective implementation throughout the project, trends and metric analysis, and training project personnel on risk management. The Risk Manager is also responsible for creating and maintaining the Risk Register (or Log), unless this task is delegated to a team member

In implementing the plan, the risk manager is responsible for ensuring periodic overall risk assessment and reviewing it with the team and stakeholders.

- Work and communicate progress on most severe risks first.
- Set realistic due dates and then work to meet the dates.
- Mitigate risks at the appropriate level (i.e., project, team, sub-team).
- Keep stakeholders informed on current risk status.
- Document the planned risk mitigation history and actual mitigation of a risk. This documentation serves as a key input to root cause analysis, key learning, metrics, and risk analysis.

- For high impact, impending risks, a rapid decision turnaround may be required, as determined by the Risk/Project Manager. In such cases, available applicable team members will make the decision

4.8.2 Approach

The development of the Risk Management Plan was done through a review of the work done for the initial Feasibility and Design phase of the project. The Project Manager through a methodical and analytical approach which involved documentary review and expert judgement identified and evaluated the various risks, both those identified in the scoping process in the feasibility study and design process and new or alternate risks. The risks were evaluated through a probability and impact scoring matrix and then prioritized for either observation, monitoring and/or mitigation. Status updates including risks identified will be reported on a bi-monthly basis to the FAARPII Project Management Committee routed through the Project Manager.

Project plans, updates or changes that are needed as a result of the risk responses or identification of new or emerging risks will require the approval of the FAARPII Project Management Committee and will be captured in the Project Management Information System (PMIS). Changes or updates required due to changes in personnel, scope, budget, equipment limitations, etc. will be routed through the Project Manager to the Project Management Committee. The project manager is responsible for managing all proposed and approved changes to the Risk Management Plan. Once the change is approved, the project manager will update the plan and supporting documentation and will distribute the updates to the project team and all stakeholders. This methodology is consistent with the Change Management Plan and Project Charter and ensures that all stakeholders remain informed of any changes.

4.8.3 Risk Identification

The risks associated with the project were identified using a series of approaches starting with the examination of the risks identified in the Feasibility and Design Studies and Project Charter as the preliminary risk lists. The assumptions in the Project Charter were evaluated following an Assumption Analysis process and the results of this process were moved into the risk log.

In compiling the preliminary risk lists the following sources of risk identification were utilized:

- Expert Judgment: interviews with sector specialists from within government and outside of government were conducted to identify and evaluate potential risks.
- Risk Assessment Meeting: meeting with key team members and stakeholders.
- Analog Data: information from historical data inclusive of rates and estimates from other extractive sector operators was incorporated and used to identify common risks as well any potential strategies to mitigate risks associated with extractive works.

The results of these processes were entered in the risk register and evaluated.

4.8.4 Risk Monitoring

The FAARPII Project manager is responsible for the monitoring and reporting of the project risks. Bi-Monthly reports inclusive of any new or emerging risks, risk responses and effectiveness of risk responses will be presented to the FAARPII Project Management Committee.

The risks identified and ranked very high and high in the risk register will be added to the project schedule and monitored by either the Project manager during the Design Review phase and jointly by the Project Manager and the Supervisory

Consultant during the Construction phase dependent on the area in which those risks fall. The monthly Project Management Committee meetings will be used to assess effectiveness of risk response strategies and the need to alter or add additional risk responses. The risk monitoring will be continuous throughout the life of the project and also includes the identification and monitoring of the trigger conditions for each risk to help determine if a risk is likely to occur or is being approached, the results are documented in the risk log.

4.8.5 Risk Mitigation and Avoidance Strategy

Mitigation and avoidance strategies have been identified for the high priority risks (high, medium and low risks) as identified in the risk prioritization sections. The strategies include adjustments to the project plan and the inclusion of mechanisms for effective project management that limit or reduce the potential impacts

4.8.6 Project Management Plan Updates/ Documents Updates

Changes to the Project Management Plan or Project Charter will go through the established change control process and will require the approval of the Project Sponsor. Updates to this Risk Management Plan or the Risk Register will be made where the need to capture new or emerging risks has been identified or where the project needs have been amended or shifted.

Similarly updates to the Issue Log, Lessons Learnt Register and the Stakeholder Register, Risk Register will be made in keeping with new or emerging information, provided that these changes are approved by the FAARPII Project Management Committee and captured in the PMIS.

Chart 44. Risk Breakdown Structure (Source: A. Jn. Baptiste, 2019)

FARRPII-Package 1- Risk Breakdown Structure (RBS)			
RBS Level 0	**RBS Level 1**	**RBS Level 2**	**RBS Level 3**
0. All sources of project risk	1. Technical Risk	1.1 Requirements Definition	1.1.1 Scope definition exceeds available financing
			1.1.2 Site conditions allows for side roads to be repaired within project cost
		1.2 Estimates and Assumptions	1.2.1 Possibility of a cost overrun during the construction phase
			1.2.2 Required works exceed budget costs for project
			1.2.3 Management reserves allow for additional works
		1.3 Technical processes	1.3.1 Changes in design and construction standards once the construction has started
			1.3.2 Delays might occur during the construction phase, caused by delays in approval of designs and change requests.
			1.3.3 Detailed Design approvals and consents might be delayed.
		1.4 Technical Specifications	1.4.1 Earthworks and civil works below Technical specifications
		1.5 Skilled/Trained Personnel	1.5.1 Delayed construction to find competent equipment operators
			1.5.2 Delayed construction to find adequate skilled staff
		1.6 Equipment Failure	1.6.1 Work delays occur so that repairs may be facilitated or substitute machinery cannot be found
			1.6.2 Additional cost to source alternate equipment
		1.7 Contractor Performance	1.7.1 Contractor performs below standard due to contract type (lump sum contract)
			1.7.2 Contractor adherence to terms and conditions of contract
			1.7.3 High turnover in labourers results in delays in schedule
		1.8 Technical Capacity of Project Team	1.8.1 Lack of technical capacity in DIPE for rehabilitation oversight can cause delays as training required
	2. Management Risk	2.1 Permits/Approvals	2.1.1 Delay in obtaining earthwork permits or approvals.
			2.1.2 Delays in obtaining Environmental approvals
		2.2 Health and Safety	2.2.1 Environment and work conditions determined unsafe for workers
			2.2.2 Injuries sustained by contractor's personnel.
		2.3 Communication	2.3.1 Communication across multiple government Departments through hierarchical system can cause delays
		2.4 Organization	2.4.1 Organizational structure may present issues human resource allocation for project activities
	3. External Risk	3.1 Environmental/weather	3.1.1 The construction site becomes unusable for a period of time causing schedule delays
			3.1.2 Machinery used on project dispatched to assist with clean-up campaign
		3.2 Geotechnical(subsidence)	3.2.1 Land Stability during or post earthworks
		3.3 Material deficiency in project area	3.3.1 Insufficient materials within project site
		3.4 Stakeholder Acceptance	3.4.1 Resistance/objection from community persons
			3.4.2 Resistance/objection from Minibus Operators
			3.4.3 Lack of participation from key stakeholders at stakeholder meetings

4.8.7 Probability and Impact Scales

Once risks were identified it was important to determine the probability and impact of each risk in order to allow the Project Manager to prioritize the risk avoidance and mitigation strategy. Risks which were more likely to occur and have a significant impact on the project were given the highest priority while those which were more unlikely or have a low impact were given a much lower priority. This was done with a probability – impact matrix.

The probability assessment involved estimating the likelihood of a risk occurring. The impact assessment estimated the effects of a risk event on a project objective. These impacts could be both positive and negative; i.e., opportunities and threats. The project objectives are numerous, e.g. the schedule, cost, quality, safety and scope. For each identified risk, the impact and probability were assessed. Interviews and meeting with experienced project participants, stakeholders, and experts in the subject are the basis for the impact and probability scales.

All the impact indicators in the table reflect the risk context of the work and in particular the risk appetite of the DIPE.

The scoring (grading) of the risks in the Risk Register was facilitated by use of a **Risk Scoring Matrix** (aka, Probability and Impact Matrix) which has as its basis the probability and impact scales. Risks were first analysed and evaluated in terms of **probability** (likelihood) of occurrence and the **impact** (seriousness) if they should occur. The probability of the risk occurring was assessed and given a rating of Very Low (VL), Low (L), Moderate (M), High (H), or Very High (VH) likelihood. Separately the impact upon the project if the risk were to occur was given a rating of Very Low (VL), Low (L), Moderate (M), High (H), or Very High (VH) seriousness. Using these ratings in conjunction with the Risk Scoring Matrix, the risks were then graded to provide a measure of the project's risk exposure for each.

4.8.7.1 Probability

On the basis of the chances of occurrence of the risks, each risk was classified under one of the following probabilities:

Chart 45. Probability Scale Definition (Source: A. Jn. Baptiste, 2019)

FAARPII-Package 1- Probability Scale Definition		
Likelihood		Description
Relative	Numerical	
Very Low	0.1	Highly unlikely to occur.
Low	0.3	Will most likely not occur
Moderate	0.5	Possible to occur
High	0.7	Likely to occur
Very High	0.9	Highly likely to occur

4.8.7.2 Impact

Based on the impact that a risk will have on the project, the risk was classified under one of the five degree of impacts.

Chart 46. Impact Scale Definitions (Source: A. Jn. Baptiste, 2019)

FAARPII-Package 1- Impact Scale Definition					
Objective	**Relative / Numerical Scale**				
	Very Low / 0.05	**Low / 0.1**	**Moderate / 0.2**	**High / 0.4**	**Very High /0.8**
Cost	Insignificant change in cost	< 1-2% increase	2 - 4% increase	4 - 8% increase	> 8% increase
Time	Insignificant change in schedule	< up to 1-week slip	1 – 2-week slip	2 – 3-week slip	> 3-week slip
Scope	Barely noticeable scope decrease	Minor areas affected	Major areas affected	Unacceptable reduction	Project end item effectively useless
Quality	Barely noticeable quality degradation	Only a minor reduction of quality	Quality reduction requires sponsor approval	Unacceptable quality reduction	Project end item effectively useless

4.8.7.3 Probability and Impact Scales (P x I)

Chart 47. Probability and Impact Scales (Source: A. Jn. Baptiste, 2019)

FAARPII Package 1- Probability and Impact Scales (P x I)										
Probability				**Impact**			**PxI**			
Scale	**Score**	**Range**	**Description**	**Scale**	**Score**	**Description**	**Score**	**Range**	**Description**	**Classification**
1	0.1	Very Low (VLO)	less than 10 percent chances of occurrence	1	0.05	Insignificant: Risks which do not pose any significant threat and which can be left unmediated without any fear	0.18 to 0.72	From 18 to 25	High (HI)	
2	0.3	Low (LO)	10 to 30 percent chances of occurrence	2	0.1	Marginal: Any risks which will have just a mild impact on the project, still these must be addressed in time	0.06 to 0.17	From 11 to 17	Moderate (MED)	
3	0.5	Moderate (MED)	30 to 50 percent chances of occurrence	3	0.2	Moderate: Risks which will cause some problems, but nothing too significant	0.01 to 0.05	From 1 to 10	Low (LO)	
4	0.7	High (HI)	50 to 70 percent chances of occurrence	4	0.4	Critical: Risks which can significantly jeopardize some aspects of the project, but which will not completely ruin the project				
5	0.9	Very High (VHI)	70 to 100 percent chances of occurrence	5	0.8	Catastrophic: A risk that can prove detrimental for the whole project				

Chart 48. Probability and Impact Scales Definition (Source: A. Jn. Baptiste, the author, September,2019)

FAARPII-Package 1- Probability and Impact Scales									
Scale	**Probability**	**Probability Score**	**Description**	**Technical Performance**	**Cost**	**Schedule**	**Scope**	**Quality**	**Impact Score**
Very Low (VLO)	<10%	0.1	A risk event that, if it occurs, will have little or no impact on achieving outcome objectives. Highly unlikely to occur	Requires minor (no impact to cost and or/schedule) performance trades within the threshold-objective range; No impact on program success.	Project budget not affected. Cost increase can be managed within plan. Budget impacted by less than 1%	Schedule not affected; Schedule adjustments can be managed within plan. Able to meet key milestones with no schedule float.	Temporary defects, causing minor short term consequences	Barely noticeable quality degradation	**0.05**
Low (LO)	10 to <30%	0.3	A risk event that, if it occurs, will have a minor impact on achieving desired results, to the extent that one or more stated outcome objectives will fall below goals but well above minimum acceptable levels. Will most likely not occur	Performance below goal but within acceptable limits; No changes required. Does not meet an objective requirement.	Project budget impacted by greater than 1% but less than 2%.	Minor schedule slip. Non critical path activities late; Impact to critical path up to 1 - week slip.	Product performance shortfall in area of tertiary (minor) importance	Only a minor reduction of quality	**0.1**
Moderate (MED)	30 to <50%	0.5	A risk event that, if it occurs, will have a moderate impact on achieving desired results, to the extent that one or more of its stated outcome objectives will fall below goals but above minimum acceptable levels. Possible to occur	Performance below goal; Moderate (cause noticeable cost and/or schedule increases-not more than 5% on the project) changes required; Does not meet a threshold requirement.	Project budget impacted by greater than 2% but less than 4%. Does not require significant use of project cost and/or schedule reserves.	Moderate schedule slip 1-2 weeks schedule slip	Product performance shortfall in area of secondary importance	Quality reduction requires sponsor approval as important areas are affected.	**0.2**
High (HI)	50 to <70%	0.7	A risk event that, if it occurs, will have significant impact on achieving desired results, to the extent that one or more stated outcome objectives will fall below acceptable levels. Likely to occur	Performance unacceptable; Significant (high cost and/or schedule increases-more than 5% on the project) changes required; Does not meet a threshold requirement	Project budget impacted by greater than 4% but less than 8%	Increases critical path schedule by 2 to 3 weeks	Minor product performance shortfall in area of primary (critical) importance	Unacceptable quality reduction	**0.4**
Very High (VHI)	>70%	0.9	A risk event that, if it occurs, will have a severe impact on achieving desired results, to the extent that one or more of its critical outcome objectives will not be achieved. Highly likely to occur	Performance unacceptable; Does not meet a Key performance requirement	Project budget impacted by greater than 8%	Key program event or milestone delayed by more than 3 weeks	Significant failure of product to meet one of its primary (critical) purposes	Project end item effectively useless	**0.8**

4.8.7.4 Probability and Impact Matrix

This matrix was used to classify risks on the basis of the impact they will have on the project and the probability of their occurrence. The scale used for classifying risks along these two risk measurement metrics is given in the Probability and Impact scales table.

Probability	Threats					Opportunities					Probability
Very High 0.90	0.05		0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05	Very High 0.90
High 0.70	0.04		0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04	High 0.70
Medium 0.50	0.03		0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03	Medium 0.50
Low 0.30	0.02		0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02	Low 0.30
Very Low 0.10	0.01		0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01	Very Low 0.10
	Very Low 0.05		Low 0.10	Moderate 0.20	High 0.40	Very High 0.80	Very High 0.80	High 0.40	Moderate 0.20	Low 0.10	Very Low 0.05	
	Negative Impact						Positive Impact					

Key
High
Medium
Low

Figure 36 Probability Scale Definition (Source: A. Jn. Baptiste, 2019)

4.8.8 Classifying and Prioritizing Risk

After each risk was placed in the matrix, it was given an overall “risk ranking.” Risks that had severe negative consequences *and* are highly likely to occur received the highest rank; risks with both low impact and low likelihood received the lowest rank. Impact and likelihood ratings were combined to help identify which risks pose the greatest overall threats (and therefore are the top priority to address).

Based on how each risk scored on these two scales they were placed in one of the intersecting cells. Once all the risks were allocated a place on this risk management probability and impact matrix, the entries on this matrix were interpreted as follows:

Each of the cells on the 5×5 matrix were given one of the three colours – red, yellow and green. The significance of each colour is:

Red (High Risk) – All risks that fall in the red cells are of utmost importance. Prevention and mitigation strategies for all these risks must be framed much in advance so as to prevent their occurrence or to fight them back as soon as they surface up.

Yellow (Medium Risk) – These are the risks that must be optimally addressed**;** however, they do not enjoy top priority like the risks in red cells. These are also significant risks and they are included in the risk management strategies.

Green (Low Risk) – These are risks have the least likelihood of occurrence and the lowest impact and can be left out during the formulation of risk management strategies, as these are low priority risks. Remediation on these risks should be done were the cost of remediation is low or negligible.

4.8.9 Interpretation

	Consequences				
Likelihood	**Insignificant**	**Marginal**	**Moderate**	**Critical**	**Catastrophic**
Very High	Low 9	Medium 14	High 18	High 22	High 25
High	Low 7	Medium 12	Medium 17	High 21	High 24
Medium	Low 5	Low 10	Medium 15	High 19	High 23
Low	Low 3	Low 6	Medium 11	Medium 16	High 20
Very Low	Low 1	Low 2	Low 4	Low 8	Medium 13

Figure 37 Probability Scale Definition (Source: A. Jn. Baptiste,2019)

Chart 49. Recommended Corrective Action (Source A Jn. Baptiste, 2019)

Risk Level	Action Required
High Risk 18 - 25	· This rating level is not acceptable · Report immediately to Senior Management; · Consider alternative activity unless appropriate controls are implemented · Develop specific Treatment/Action Plan for immediate implementation to address high risks · Allocate actions and budget for implementation within one month · Report to Senior Management on effectiveness of control
Medium Risk 11-17	· Develop and implement a specific Treatment/Action Plan for medium risks · Consider alternative activity unless appropriate controls are implemented · Allocate actions and budget to minimize risk; monitor

Risk Level	Action Required
	implementation · Report to Senior Management on effectiveness of control
Low Risk 1 – 10	· Accept and Monitor low-priority risks · Manage via routine procedures where possible; Monitor via normal internal reporting mechanisms

4.8.10 Risk Register-Key Terms

The Risk Register shows the details of all the identified risks for the project. The register breaks down each risk to show the cause, consequence, probability, impact, trigger, owner, strategy and cost. Each of the elements is described below:

RBS Code - The RBS code links each risk to the Risk Breakdown structure.

Cause - A cause is a definite event or a number of circumstances inherent in a project or its environment that may give rise to an uncertainty and can trigger risks.

Risk - A risk is an uncertainty that may affect the achievement of the project goals. Many times, risks are considered only negative, however, positive risks may occur. Negative risks are called threats while positive risks are called opportunities. Positive risks can present opportunities for improvement in the project as much as negative risks can cause faults and failures.

Consequence - A consequence is the result of an identified risk occurring. Consequences may range from slight delays in schedule or increased costs to project failure, including abandoning the project.

Probability - Probability is the numerical value assigned to each risk to measure the likelihood of the risk occurring. Probability measures from 0.1 - very unlikely to occur to 0.9 very likely will happen.

Impact - Impact is also a numerical value assigned to each risk which measures how much the associated risk would affect the outcome of the project. The grades range from <10% which is very low to >70% which is very high.

P x I - Probability times impact is the probability assigned multiplied by the impact assigned.

Trigger - Trigger is event or circumstance that activates the causes that results in the risk occurring.

Owner - Owner is the entity with whom the risk would be assigned.

Strategy - Strategy is the action that will be taken to mitigate the risk should it occur or to pass on the risk to another entity.

Cost - the estimated value of the impact should the risk occur

The Risk Breakdown Structure can assist with fundamentally the identification and decomposition of risks. It is recommended to the Project Management Team to examine closely the RBS, as it is vital in providing the risk of exposure on the project. It is a valuable tool that can prove very beneficial to the Project Management Team.

It is recommended when using the Probability and Impact Scales, to use precise probability scores that will better define the overall impact on the project. It is best to be as detailed and descriptive as possible, as this will assist with getting a better understanding and allow the team to prioritize, more effectively.

The Probability and Impact Matrix is another beneficial tool. It is recommended that the Project Management Team carefully review to get a better understanding

of the risks that may affect the project, as per the combined probability and impact (P x I) of the occurrences of the risks.

The risk register is another important tool that is recommended to be used. It will assist with the identification of potential risks and the information surrounding the risks. This will keep track of a project with a great number of working components. It can provide accountability by correctly assigning an owner responsible for each risk. The risk register can work great to effectively gather potential risks and provide valuable information for developing a plan to deal with the risks and keep the project on track. All necessary changes to the register will be made by the project manager through an integrated change control process.

Chart 50. Risk register (Source: A. Jn. Baptiste, 2019)

FAARPII-Package 1: Risk Register												
RBS Code	Cause	Risk	Consequence	Probability	Impact	*P x I*	Classification	Trigger	Owner	Strategy	Cost to Project	Cost (additional Comments)
3.4	Mistrust of Public of Government Initiatives	Lack of buy-in from the community	Opposition to project scope	0.5	0.8	0.4		Lack of participation by community in stakeholder meetings. Open hostility to the planned works.	Project Manager / Communications Officer	Risk Mitigation: Include budget for public awareness and plan public meetings, brochures and other educational ventures to sensitize the public of the initiative	$25,000.00	Printed Material and awareness campaign cost of $25,000.00
1.3	Conditions which informed initial designs have changed.	Changes/variations in design and construction standards	Schedule delays and cost variation, possible scope creep.	0.7	0.4	0.28		Design changes totalling in excess of 25% of the project cost and or incurred delays affect the critical path.	DIPE/ Steering Committee	Risk Mitigation: Hire third party Independent consultant to review and design rehabilitation layout.	$127,471.30	Consultant cost of $127,471.30
3.1	Major unforeseen weather events or natural disasters.	The construction site becomes unusable for a period of time. Machinery used on project dispatched to assist with clean-up campaign	Schedule delays and loss of resources	0.7	0.4	0.28		Precipitation in excess of anticipated levels with delays in works of greater than 1 week/ equipment removal from site of greater than 1 week	DIPE	Risk Mitigation: Establish disaster management plan; include time buffer in schedule for delays due to weather	$37,973.60	Cost of plan $0.00 as this is a Design review Requirement. Cost of time buffer of 2 weeks equivalent to $37,973.60 (2% project budget)

1.1	Fixed and/or Limited Budget	Scope definition too large for available project funds	Some activities will not be accomplished unless additional funds can be identified	0.5	0.4	0.20		Results of rates review and volumetric calculations of material requirements for rehabilitation	DIPE / Ministry of Finance	Risk Mitigation: Negotiate with Funding Agency for additional funds.	$0.00	No addition cost as request is to be undertaken GOSL staff and engaged consultant for design review or supervision.
2.2	Site safety issues	Injury to Contractors employees or hazardous working conditions	Schedule delays, work stoppage and cost implications	0.5	0.4	0.20		Results of Health and Safety (HSE) Personnel reports/ site incident	Contractor / HSE Personnel	Risk Transfer: Contractors to obtain third party insurance to cover compensation for injuries can be applied. Risk Transfer: Contractor to pay employee Social Security so that employees can claim Social Security Benefits in the event of injury	$0.00	Insurance costs or premium (to be covered by contractor)
3.5	Bureaucracy	Failure to effectively deal with project issues in a timely manner.	Schedule delays	0.3	0.5	0.15		failure to achieve milestones	Project Manager/Supervisory Consultant	Risk Mitigation: Adequate project management and timely decision making.	$0.00	This may result in delay damage claims by the contractor.
1.6	Equipment Failure	Heavy Equipment Failure/Breakdown during operations	Schedule delays if alternate equipment cannot be sourced or repairs done in a timely manner	0.7	0.2	0.14		Comparison of progress against Project Schedule; works behind schedule by greater than 25% or equipment replacement/rep	Contractor	Risk Mitigation: Draft contract with strict performance criteria and guidelines, inclusive of penalty clauses for non-	$0.00	Contract Drafting Services included in Design Review Consultants Terms of Reference

								air exceeds two weeks		performance. Risk Mitigation: Monitored by Supervision team/ Contractor to have qualified mechanic as part of staff compliment.		
1.7	Contractor incompetence	Contractors perform below required levels	Schedule delays, additional cost	0.7	0.2	0.14		Comparison of progress against Project Schedule; works behind schedule by greater than 25%	Steering Committee Contractor	Risk Mitigation; Develop and implement strict selection criteria and requirements guidelines. Risk Mitigation: Utilize contract with strict performance criteria and guidelines, inclusive of penalty clauses for non-performance .	$0.00	No additional cost as contract drafting services covered under the Design Review Consultancy
1.2	Fixed and/or Limited Budget	Unknown site circumstances may cause scope of works to exceed available budget allocated for two demonstration projects	Activities may not be completed to a satisfactory level	0.3	0.4	0.12		Results of initial survey of the road and intervention requirements for road rehabilitation	CDB	Risk Mitigation: Negotiate with Funding Agency for additional funds to cover any works due to site conditions. Risk Mitigation: Ensure that Cost Management plan has adequate Management Reserve.	$0.00	No additional cost as project document writing is covered in DIPE's cost. Further there are no cost to Government as negotiations will be undertaken by GOSL staff.

1.4	Limitations in available equipment and contractors that meet selection criteria	Earthworks and civil works below Technical specifications	Schedule delays and cost overruns for rework of activities below acceptable standards	0.3	0.4	0.12		Failed inspection of physical infrastructure works.	Contractor	Risk Mitigation; Develop and implement strict selection criteria and requirements guidelines. Risk Mitigation: Utilize contract with strict performance criteria and guidelines, inclusive of penalty clauses for non-performance . Risk Mitigation: ensure that adequate technical inspection frequency is included in the Schedule Management Plan. Hire technical consultant to conduct third party quality tests.	$14,000.00	Contractors cost of $14,000.00 to perform periodic technical specification tests
1.8	Limitations in available persons with technical capacity in Government	DIPE personnel inexperienced in conduction of rehabilitation works	Schedule delays in order for staff to be trained on techniques	0.3	0.4	0.12		Activities oversight delayed by two weeks or more	Project Manager	Risk Mitigation: Utilization of a civil engineering consultant in overseeing activities while capacity building is underway.	$206,800.00	Consultant cost of $206,800.00

4.1	Government/Contractor's Pricing Mechanism for land rental	Opposition to access to lands to facilitate the works.	Aspects of the works delayed due to unproductive negotiations over access to lands and land rental.	0.3	0.4	0.12		Survey of business community as to acceptable price point for land rental.	Lands and Surveys Department/ Project Manager	Risk Mitigation: Conduct assessment of current rent price of lands within the project area. Risk Mitigation: Public awareness campaign that appeals to stakeholders to be engaged and involved to ensure speedy price negotiations for land access and rental.	$0.00	Comparative price assessment survey done by the Lands and Surveys Department which is an arm of the GOSL.
4.2	Government Financial System	Counterpart funding from government for effecting payments under the project delayed	Interest claims from consultant and contractor for late payments. Can affect the contractor/consultants cash flow and thus can affect progress of the design review and progress of the works.	0.3	0.4	0.12		Non receipt of funds in a timely manner from Ministry of Finance	Ministry of Finance/ Office of the Budget /Permanent Secretary of DIPE	Risk Mitigation: Engage Ministry of Finance and Office of the Budget prior to commencement of the project. Risk Mitigation: Build into the contractor / consultant contract conditions which allow for a 56 day window for payment. Also fix interest rate before contract signing so as to minimize on additional cost and to avoid disputes.	$0.00	No additional cost to project as Ministry of Finance is an identified stakeholder.

3.2	Geological hazards and uncertainty	Land stability due to geotechnical risks of land subsidence as a result of heavy rainfall	Additional slope stabilization works to be undertaken resulting in delays and additional costs.	0.3	0.2	0.06		Failed inspection of physical infrastructure works/ observation of land subsidence.	Contractor/ Supervisory consultant	Risk Mitigation: Hire technical expert to conduct specification tests for land stability. Risk Mitigation: include approval process for Technical advisor review of engineering designs prior to implementation to ensure they are adequate.	$0.00	. No Additional Cost as technical advisor (engineer) included in initial project budget.
2.3	Weak Matrix Organizational structure exists in Government institutions	Lack of adequate coordination across Government agencies	Schedule delays	0.5	0.1	0.05		Slippage in Schedule activities of greater than one week	Relevant Agency Heads	Risk Mitigation: Identify point persons in related agencies to facilitate necessary processes.	$0.00	No additional cost as point persons are government staff.
2.4	Weak Matrix Organizational structure exists in Government Institutions	Lack of adequate allocated time to project activities by Government employees	Schedule delays	0.5	0.1	0.05		Slippage in Schedule activities of greater than one week	Project Manager	Risk Escalation: Escalate to respective Functional Line Managers if tasks are behind schedule.	$0.00	No additional cost as Functional Managers are government staff.
1.5	Limitations in available persons with technical capacity in construction industry	Human resource limitations of Contractor to carry out project activities	Schedule delays	0.1	0.4	0.04		Comparison of progress against Project Schedule; works behind schedule by greater than 25%	L Project Steering Committee/ Contractor	Risk Mitigation; Develop and implement strict selection criteria and requirements guidelines for contractor suitability and selection. Risk Mitigation: Include provisions for use of non-	$0.00	No additional cost to project

										nationals for key technical positions if not available within country		
2.1	Lack of familiarity with regulatory requirements	Delays in obtaining relevant permit and approvals	Schedule delays	0.1	0.2	0.02		Permits and Approvals exceed two weeks beyond normal processing time	Project Manager	Risk Mitigation: Conduct sensitization sessions with contractors and sub-contractors to familiarize them with requirements, including a guide with regulatory requirements	$0.00	Workshop sessions included in project Management Cost.
3.3	Ad hoc/unplanned removal of materials from project site during construction activities	Insufficient materials within the project site to conduct rehabilitation works	Additional costs to source alternate materials; cost overruns, additional time required to source additional material	0.1	0.2	0.02		Results of initial survey of and volumetric calculations of material requirements for rehabilitation	Project Manager/Supervisory Consultant	Risk Mitigation: Supervisory consultant to ensure that the contractor has at all times an approved updated Resource Management Plan	$0.00	Included in the Supervisory Consultants terms of Reference
Risk Mitigation Cost											$411,244.90	

It is mandated that a risk strategy be developed for each identified risk on each project. This is vital as it allows the team to assess the risks that has the greatest impact on the project to be correctly controlled.

This document has provided a framework for dealing with identified and emerging risk on the project. This framework serves as a tool which will assist the Project Management Team determine and make some important decisions in respect of risk responses. The aim of this plan is to reduce any negative consequences and reduce the impact to the overall, project and to exploit any benefits from positive risks.

It needs be recognized that the Risk response plan is not cast in stone and is required to be updated on a regular basis. Development of appropriate options and action plans to reduce the threats of specific risks to project objectives is an ongoing process. Additionally, there is need on an ongoing basis to conduct reviews to develop strategies for responding to emerging risks. The updating of the specifics of the proposed response plan for the occurrence of each risk event must be an ongoing process.

Implement Risk Responses, Monitoring and Control shall follow the Plan Risk Response process.

Activities involved in Monitoring shall include:

- Establish periodic reviews and schedule them in the project plan.
- Ensure that all requirements of the Risk Management Plan are being implemented.
- Assess currently defined risks as defined in the Risk Register.
- Evaluate effectiveness of actions taken.
- Identify status of actions to be taken.
- Validate previous risk assessments (likelihood and impact).

- Validate previous assumptions and state any new assumptions.
- Identify new risks.
- Track risk response.
- Communicate risk management status and risk response follow-through as appropriate.

Activities involved in Control shall include:

- Validate risk mitigation strategies and alternatives.
- Take corrective action when actual events occur.
- Assess impact on the project of actions taken (cost, time, resources).
- Identify new risks resulting from risk mitigation actions.
- Ensure the Project Plan (including Risk Management Plan) is maintained.
- Ensure change control addresses risks associated with the proposed change.
- Revise risk management documents to capture results of mitigation actions.
- Update Risk Register.
- Communicate risk management status and risk response follow-through as appropriate.
- Establish communications as appropriate.

It is expected that most decisions will be made at the Team Lead level. The Risk Management Team shall escalate only those risks that significantly impact the project's scope, budget, schedule, change management, technical performance, and business performance objectives. Additionally, the Risk Management Team shall escalate those risks determined to need cross-organization involvement, are controversial, or require senior management involvement and/or decisions.

The Risk Management Team meeting will be conducted and facilitated by the Risk Manager who for the FAARPII is the project manager. During the Risk Management Team meeting new and past due risks shall be discussed. The risk

originators present the new risk and provide the necessary detail. The risk owners provide updates for all other risks. In addition to the Risk Management Team meeting, the Risk Management Team will brief the Project Manager on a regular basis regarding the status of risks.

The Risk Management Team shall generate standard reports as part of the risk management process. In preparation for the Risk Management meeting, the Risk Management Team prepares an updated Risk Register listing the risks for review (i.e., new, open, and ready-to-complete risks). After the Risk Management Team meets, the Risk Management Team notifies the Risk Originators and Risk Owners of the results of the meetings (i.e., status of new risks submitted, new risk assignments, and risks approved for closure) through the Risk Management Meeting Report.

At the completion of the project, the successful transition of any open risks, and capturing and harvesting lessons learned are important for Project Maintenance and Support and future project work. There is a need to:

i. Validate the completion of identified risks. For any open risks assess whether there are ongoing operational risks that warrant communication of these risks to the operational transition team. Document remaining open risks and provide access to final report.
ii. Produce final risk management metrics and evaluate process effectiveness against established benchmarks.
iii. Capture risk factors and risk mitigation plans for inclusion in Risk Reference Models.

4.8.11 Risk Management plan approval

The undersigned acknowledge they have reviewed the Risk Management Plan for the FAARPII- Package 1. Changes to this Risk Management Plan will be coordinated with and approved by the undersigned or their designated

representatives.

Signature:		Date:	
Print Name:	Sharon Griffith		
Title:	Projects Officer -CDB		
Role:	Represents the funding agency		

Signature:		Date:	
Print Name:	Ivor Daniel		
Title:	Permanent Secretary-DIPE		
Role:	Represents the project Owner		

Signature:		Date:	
Print Name:	Albert Jn Baptiste		
Title:	Chief Engineer		
Role:	Project Manager		

4.9 Procurement Management Plan

4.9.1 Introduction

The purpose of the Procurement Management Plan is to define the procurement requirements for the project and how it will be managed, from developing procurement documentation through contract closure. The Procurement Management Plan will be in compliance with the CDB's procurement guidelines and the Finance Administrative Act of Saint Lucia. In all cases the national procurement guidelines will prevail.

This Procurement Management Plan sets the procurement framework for FAARPII-Package 1. It will serve as a guide for managing procurements throughout the life of the project and will be updated as acquisition needs change. This plan identifies and defines the items to be procured, the types of contracts to be used in support of this project, the contract approval process, and decision criteria. The importance of coordinating procurement activities, establishing firm contract deliverables, and metrics in measuring procurement activities is also included.

4.9.2 Procurement Management Approach

The project manager will provide oversight and management in concert with the Permanent Secretary and the CDB's project officer responsible for the project. The Project Manager will work with the project team to identify all items to be procured for the successful completion of the project. The project manager will then review the procurement list with the Permanent Secretary subject to the approval of the CDB. The process involves determining what to acquire, how to acquire it, how much is needed, and when to acquire it.

4.9.3 Procurement Definition

The following procurement items and/or services have been determined to be essential for completion and success of FAARPII-Package 1.

Chart 51. Services Required (Source: A. Jn. Baptiste,2019)

Service required	Procurement Method
Detailed Designs Review and Supervision of Works	Quality and Cost Based Selection
Road Rehabilitation	International Competitive bidding

In addition to the above list of procurement items, the project engineer is authorized to approve purchases for the project team.

4.9.4 Contract type

All items and services to be procured for the project will be solicited under firm-fixed price contracts for consultancy and Unit-rate (price) or measurable contracts for works. The project team will work with the office of the Permanent Secretary to define required delivery dates. In respect of the Request for Proposal (RFP) the Project Manager will solicit bids from various vendors in order to procure the items within the required time frame and at a reasonable cost under the approved contract type once the vendor is selected.

4.9.5 Prequalification of Service Providers

Prequalification or screening of potential service providers will establish a short list of bidders who possess the required technical and commercial capability to perform the work packages. Prequalified sellers will be invited to submit a response to the procurement solicitations.

4.9.6 Contract Statement of Work

The contract statement of work (SOW) shall describe the facilities to be constructed in sufficient detail to allow potential bidders to determine if they are capable of providing the required construction services. Performance specifications shall state requirements in terms of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. Detailed specifications shall specify design requirements, such as

materials to be used, how a requirement is to be achieved, or how an item is to be fabricated or constructed. Contract SOWs can contain both performance and detail requirements.

In addition, the SOW shall describe any special requirements, performance reporting, post-project operational support, and/or specific content and format requirements. The SOW should specify what is included and excluded in the scope of work. This may include a methods statement for all primary construction activities. This should be used cautiously to reduce risk transfer back to the DIPE for prescriptive direction of construction.

The project manager shall develop the SOW. The SOW and associated tender documents shall be clear and concise, and specify all contract requirements.

All project delivery components shall be included in the contracts. It is crucial that special attention be devoted to complete and develop concise documents with a high level of accuracy to avoid legal challenges down the line.

4.9.7 Procurement Documents

In the public sector, processes mandate that the DIPE prepare documents to support the request for seller responses and selection. Preparation will include a review of regulatory procurement requirements, the contractual interpretation of the contract documents, and the proposed project delivery method. A review of the contractor evaluation and selection criteria is a critical component that needs clarity to avoid the risk of unfair or ethically suspect contractor selection. Such reviews shall include the following:

- **Standard forms.** Standard form as detailed in the CDB's procurement guidelines shall be used. These will help reduce the time and expense for each contract and tender solicitation. These will help standardize processes from project to project and help ensure the quality of the final agreement.
- **Procurement documents.** These documents will describe the tendering procedures and seller evaluation process and criteria, and convey the

information to be submitted by the seller. These documents will specify the following:

- The items the DIPE is expecting with the seller's response to satisfy the deliverables and requirements, which will include among other things price data, list of information such as drawings, product data, and preliminary bill of quantities (BOQ); company brochures/contract history; and qualifications of key personnel.
- The processes the DIPE will use to evaluate the seller's response. A brief outline providing a brief narrative on how the bid information in the seller's response will be evaluated to determine the contract award will be included. For RFPs, the bid information for all seller responses is evaluated. Evaluation criteria shall be listed in order of importance with the highest-weighted criteria listed first.

4.9.8 Procurement process

The procurement activities for the selection of consultants/contractors for this project is guided by CDB's Procurement Guidelines and **Chapter 15.01- Finance (Administration) Act of Saint Lucia Revised Edition (2001)** In all cases the national procurement guidelines will prevail.

The Project Manager along with the Permanent Secretary will engage the CDB to determine the type of procurement model that best meets the need of the project. If necessary, a Request for Information (RFI) may be released as a first procurement step to gather information.

The procurement documents must be submitted to the CDB for endorsement. The Attorney General's Office of the GOSL must provide the final approval.

The Project Manager will be responsible for the processes to develop and advertise expressions of interest (EOI). The Central Tenders Board (CTB) will open the EOI and provide the Project Manager copies of the documents for evaluation. An evaluation committee of at least three (3) persons approved by the CTB will evaluate and shortlist prospective bidders.

The Project Manager will prepare an evaluation report and submit to the CDB for “no objection” and to the CTB for approval. The approved shortlisted bidders will be invited to submit proposals using a prescribed template from the CDB. All proposals will be received and opened by the CTB. Subsequent to the opening the CTB will make the proposals available to the approved evaluation committee. The technical and financial evaluation report inclusive of the proposals will be submitted to the CDB for “no objection” and CTB for approval.

A contract will be awarded to the top ranked bidder based on the technical and financial evaluation. The Project Manager will facilitate the negotiation and contract award process. All meetings must be documented. A major concern for solicitation and bidding processes in the public sector is the potential for corruption and bribery. The use of governance principles and process audits will help ensure that proper, ethical, and professional conduct is continually in place.

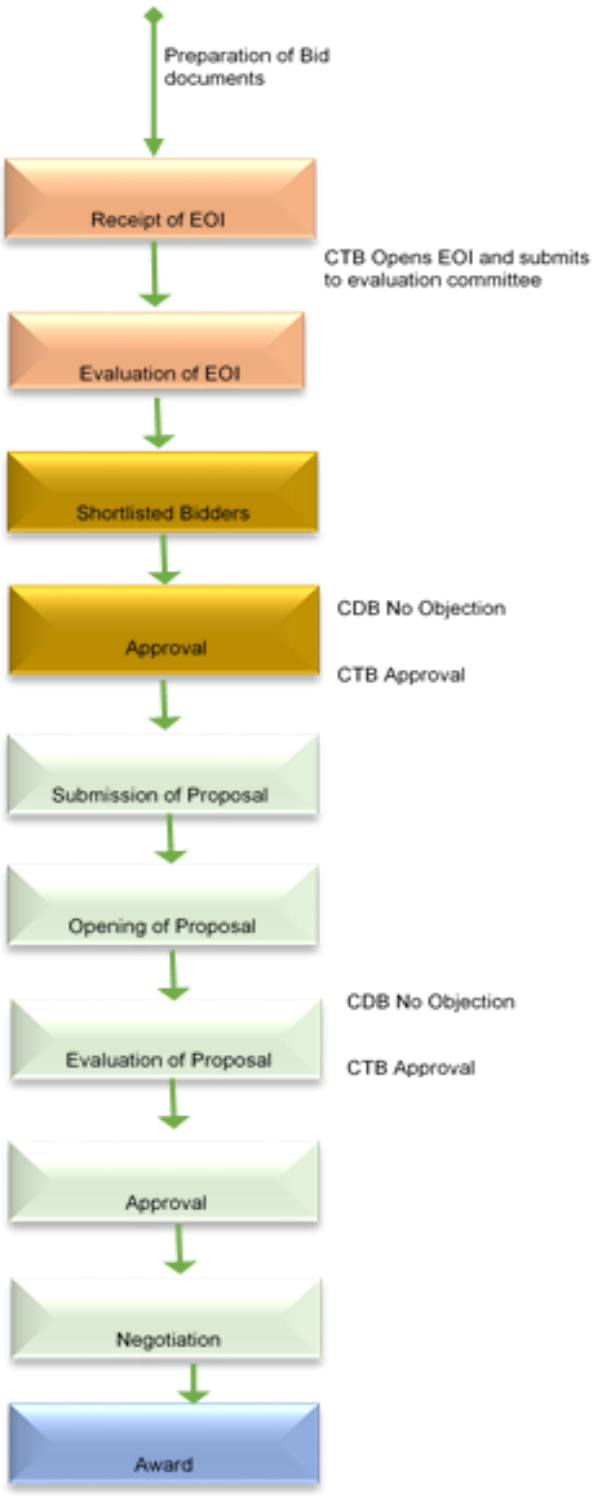


Figure 38.Flow Chart showing the procurement Process (Source: Perle Alcindor, Deputy Chief Economist, Department of Economic Development-Saint Lucia)

4.9.9 Evaluation and Selection of Sellers

The process of selecting sellers as service providers (contractors) will include the receipt of bids or proposals and the application of evaluation criteria to select one or more sellers that are both qualified and acceptable as sellers. Expert judgment in the form of Evaluation teams appointed by the Central Tenders Board will play a key role when interpreting seller proposals. Special attention to detail must not be overlooked in exchange for just selecting the lowest bid price.

The priced proposals of the contract bidders (sellers) will be compared against an independent estimate prepared by the DIPE. Evaluating the priced proposals against the independent estimate will help ensure that the bidder has understood the criteria and can realistically perform the contract work at the stated price and has offered a fair price.

Financial modeling in the form of Sensitivity Analyses will be used to assess the bidders' proposals, and as a means to control any potential bias in the selection process.

Negotiations will be entered into with the lowest evaluated bid in each instant subject to the approval of the CDB and CTB to determine the exact terms and conditions of the seller's work. This step can be a complex, independent process involving many inputs and considerations surrounding the scope and payment terms. Decisions need to be made and documented, as they become the basis for the contract agreement.

4.9.10 Decision Criteria

The criteria for the selection and award of procurement contracts under this project will be based on the following decision criteria:

- Relevant construction experience;
- Identification of key members, including résumés with descriptions of relevant work experience and upper-level team members, such as project managers;

- Project health, safety, security, and environmental and sustainability programs that indicate the contractor's approach and experience with these project components. A verification of the bidder (seller) experience rate from its workers' compensation insurance carrier can be used to validate a contractor's safety record;
- Description and availability of the proposed project resource elements, such as manpower, equipment, machinery, and materials;
- Description of and experience with quality programs, including quality planning, quality assurance, and quality control;
- Surety bonding that demonstrates the ability to secure construction surety bonds for the appropriate amount and coverage;
- Insurance certificates that meet the requirements set forth in the contract documents;
- Previous contract disputes that describe any claims of the material breach of contract that have led to arbitration, litigation, or some other form of dispute resolution proceedings; and
- Regulatory requirements that demonstrate the ability to comply with any special regulations for the project.
- Vendor financial documentation
- General Qualifications & Experience (vendor and proposed staff)
- Quality
- Ability of the vendor to provide all items by the required delivery date
- Cost

These criteria will be measured by the Central Tenders Board's appointed evaluators. The final decision will be made based on these criteria as well as available resources.

4.9.11 Procurement Risks

All risks shall be managed in accordance with the project's risk management plan. However, there are specific risks which pertain specifically to procurement which must be considered:

- Unrealistic schedule and cost expectations for vendors
- Capacity capabilities of vendors
- Conflicts with current contracts and vendor relationships
- Potential delays in obtaining materials and resources and impacts on cost and schedule
- Questionable past performance of vendors
- Potential that final deliverables do not meet required specifications

These risks are not exhaustive and the standard risk management process of identifying, documenting, analysing, mitigating, and managing risks will be used.

4.9.13 Procurement Risk Management

All project risks will be managed in accordance with the project's risk management plan. For risks related specifically to procurement, there must be additional consideration and involvement. Project procurement efforts involve external organizations and potentially affect current and future business relationships as well as internal supply chain and vendor management operations. Because of the sensitivity of these relationships and operations the project team will include the project sponsor and a designated representative from the office of the Permanent Secretary in all project meetings and status reviews.

Additionally, any decisions regarding procurement actions must be approved by the Permanent Secretary or, in his absence, the Deputy Permanent Secretary before implementation. Any issues concerning procurement actions or any newly identified risks will immediately be communicated to the Project Manager as well as the Permanent Secretary.

4.9.14 Vendor Management

The Project Manager is ultimately responsible for managing vendors. In order to ensure the timely delivery and high quality of products from vendors, the project manager or his/her designee will meet weekly or as deemed necessary with each vendor (Consultant or Works Contractor) to discuss the progress for each procured item (Services or Works). The purpose of these meetings is to review all documented specifications for each product as well as to review quality test findings in respect of the works. This forum will provide an opportunity to review each item's development or the service provided in order to ensure it complies with the requirements established in the project specifications. It also serves as an opportunity to ask questions or modify contracts or requirements ahead of time in order to prevent delays in delivery and schedule. The Project Manager will be responsible for scheduling this meeting on a weekly basis until all items are delivered and are determined to be acceptable.

4.9.15 Acceptance

Approved by:

_____ Date:_____

Ivor Daniel

Permanent Secretary-DIPE

_____ Date:_____

Sharon Griffith

Projects Officer -CDB

_____ Date:_____

Chief Engineer-DIPE

Project Director/Manager

4.10 Stakeholder Management Plan

4.10.1 Introduction

The DIPE is committed to developing and maintaining successful partnerships and working relationships with the people impacted both directly and indirectly by the operations associated with the implementation of FAARPII-Package 1. Good communication and stakeholder engagement are crucial to sustaining positive and enduring relationships based on trust and mutual benefit, and in turn building acceptance, support and a 'social license to operate' within the affected communities.

To date, the DIPE has undertaken significant community and stakeholder engagement as part of the environmental approval processes for the Project. Stakeholder engagement has included interactive processes, in which stakeholders and the community have been engaged as active partners.

The Stakeholder Management Plan (SMP) is targeted for all key players including residents within the vicinity of the Project potentially affected by social and environmental impacts, and includes:

- impacts management;
- consultation strategies; and
- complaints resolution.

The SMP outlines the DIPE's approach to stakeholder engagement and community consultation, as well as the complaints handling process.

The aim of the SMP is to ensure that impacts and concerns raised by stakeholders and their suggested mitigation measures are considered, by facilitating open communication and active complaint resolution.

4.10.2 Stakeholders

The FAARPII-Package 1 key stakeholder list is contained in the Key Stakeholder Register which is given below in Chart 52. It is subject to change and will be

updated over the life of the project. A core set of stakeholders will receive high-level program communication including via the biweekly DIPE project updates and project communications snapshots. Other stakeholders will be determined according to where works are occurring. Information will be provided to all affected residents and businesses, as well as any local community, sporting or special groups in the project area.

The DIPE endeavours to update key stakeholders especially community members biweekly on the works generally.

Chart 52. Stakeholder Register (Source: A. Jn. Baptiste, 2019)

STAKEHOLDER REGISTER					FAARPII-PACKAGE 1							
Stakeholder's Name	Position	Contact Information	Preferred Communication Method	Location	Role	Major Requirements & Expectations	Project Phase of Interest Section 1.2.4.2, PMBOK	Internal or External to Project	Supportive Neutral Cautious Resistant	Power (1 - low to 5 - high)	Interest (1 - low to 5 - high)	Key Stakeholder (Yes or No)
The person's name or the name of the point of contact representing an entity. If no name is available, then list the group or organization .	This is the stakeholder's position within their company or organization (Director of Marketing, Chief, Human Resources, etc.)	This includes the 2 or 3 primary means of contact (e.g., email and telephone number)	Email? Text message? Phone? Face-to-Face. Its sometimes best to have a primary and an alternate.	This is the physical location of the stakeholder - helpful for virtual teams and establishing the mode(s) for project communications	This is the stakeholder's role in the project (e.g., Sponsor, PM, Functional Manager, Client Manager, Customer Representative to Product Design, etc.)	Each stakeholder (or entity) has their own requirements and/or expectations (E.g., Sponsor - must meet delivery date; Local Environmental Group - no harm to local environment, etc.). Use this to ensure you address their expectations during project updates throughout lifecycle.	Includes the phase(s) of the project that is (are) of interest to the stakeholder (e.g., feasibility study, concept development, design, prototype, build, test, etc.). For complex, lengthy projects, you can have a separate register for each phase of the project.	Is the stakeholder internal or external to the project/ organization? (there are many reasons to document this information, such as ensuring external stakeholders don't receive trade-secret information, etc.)	People or entities who are supportive of a project will be managed much differently than people who are resistant; yet, they may both occupy the same space on the power-interest grid.	This is a relative scale - use your judgment (this sets the x-axis in the power-interest grid and ultimately helps determine communication strategy to manage stakeholders)	This is a relative scale - use your judgment (this sets the x-axis in the power-interest grid and ultimately helps determine communication strategy to manage stakeholders)	Key stakeholders have input to the Revised Stakeholder Risk Tolerance in the Risk Management Plan and possibly some management decision-making authority (e.g., Change Control Board member)
DIPE	Permanent Secretary	• email • cell number	Face to Face/Email/ Text	Ministry of Infrastructure Building, Union	• Serve public interest based on the organization's and government strategy • Resolve right-of-way issues • Approves certain changes, payments and any proposal from consultant • ensure the project is completed successfully in terms of quality, time and cost	Design must meet British and AASHTO Standards/Must meet delivery dates/Project must satisfy policy directorate	All Phases	Internal	Leading	5	5	Yes

Consultant	Team Leader/Resident Engineer	• email • cell number	Face to Face/Email/ Text	To be determined	• Communicate identified variations with the DIPE, provides the consultancy advice for the project on designing, evaluating the cost, technical issues/advice • Administers contracts and supervises the work • Develops the design of the project; produces drawings and specification; ensures that a project is implemented within cost and time, and according to quality and agreement • Reports project progress for DIPE timely • Approves work proposals from contractor • Prepare payment certificates for executed work • Communicate with local Authorities and community delegates to resolve issues and create good work environment	Must abide by Consultancy agreement	All Phases	Internal	Leading	4	5	Yes

Main Contractor	Construction Manager	• email • cell number	Face to Face/Email	To be determined	• Brings the design of project to reality • Carries out and completes the work designed by consultants to meet time, cost and quality objectives; supervises and manages operations on site; sometimes assists in design; coordinates and supervises all sub-contract work, materials and suppliers.	Must abide by General and Specific Conditions of Contract ,Health and Safety Rules, Quality Control Standards and Labour Laws.	Build/Milestone Review/Commissioning/Lessons Learned	Internal	Supportive	2	5	No
Sub-Contractor	Construction Manager	• email • cell number	Face to Face/Email	To be determined	•Carries out and completes the work ordered by main contractor	Must abide by General and Specific Conditions of Contract ,Health and Safety Rules, Quality Control Standards and Labour Laws.	Build/Milestone Review/Commissioning/Lessons Learned	Internal	Supportive	1	5	No
Caribbean Development Bank	Projects Officer	• email • cell number	Email/Phone	Caribbean Development Bank, Barbados	• Provides the necessary funds to the project; Ensures that the funds are utilized for the purpose; check if funds are used for this particular activity • Approves request for additional budget from client/DIPE	Must meet delivery date/Must stay within budget/Must fulfil requirements for first disbursement.	All Phases	External	Leading	5	5	Yes

Constituency Council -Gros Islet/Local Community	Mayor/Town Clerk/Community Leaders	• email • cell number	Face to Face/Email	Gros Islet	• Make work environment favourable by discussing with community • Resolve Right-of-way (ROW) issue collaborating with Physical planning ROW experts • Discus with community about the project and transfer community questions to DIPE	Must be notified of all disruptions associated with works/Must be briefed on the designs before works commencement.	Design Review/Build	External	Supportive	4	4	Yes
National Trust/Physical Planning	Director of the Trust/Chief Physical Planner	• email • cell number	Email/Phone	Pigeon Island National Park, Gros Islet/New Government Buildings, Waterfront, Castries	• Make sure the project doesn't pollute the environment • Recommend best mechanisms to protect the environment while construction activity is carried out	Must be consulted during design review and Works	Design Review/Build	External	Cautious	1	3	No
NGO (Non-Government Organization)	Director of AIDS Foundation/ Archaeological and Historical Society/Others	• email • cell number	Email/Phone	Ministry of Health, Waterfront, Castries/Pigeon Island National Land Mark, Gros Islet	• Creates awareness on HIV/AIDS protection mechanisms for workers/ • Discuss with environmentalists and consultants to protect community interest and environment	Must be given an opportunity to interface with workers concerning sexual health/ issues/Environmentalist must be part of the design process and must be given unrestricted access to the site during works	Design/Build	External	Cautious	1	3	No
Media	Various	• email • cell number	Email/Phone	Various	• Transmit information about the projects to the community	Must be kept informed at all times of the progress of the works	Build	External	Neutral	1	4	No

Ministry of Agriculture	Director of Agricultural Services	• email • cell number	Email/Phone	New Government Buildings, Waterfront	• Recommending on Agricultural products and Forest issues	Must be engaged during designs and be informed of all expropriation involving farm lands or lands under cultivation	Design/Build	External	Cautious	2	2	No
National Minibus Association	President	• email • cell number	Face to Face/Email		•Ensures that the interest of the Bus Transport Sector are attended to.	Design must be discussed and must be informed of all road closures and inconveniences to motorists during construction.	Design/Build	External	Cautious	2	4	No
National Taxi Association	President	• email • cell number	Face to Face/Email	Pointe Seraphine, Castries	•Ensures that the concerns of the Taxis Tour Operators are addressed.	Design must be discussed and must be informed of all road closures and inconveniences to motorists during construction.	Design/Build	External	Cautious	2	4	No
Ministry of Finance	Director of Finance	• email • cell number	Email/Phone	Financial Administrative Centre, Waterfront	• Approves budget changes based on annual budget	Must be informed of project expenses and any cost changes	Build/Milestone Review	External	Supportive	4	5	Yes
Ministry of Tourism	PS Tourism	• email • cell number	Email/Phone	New Government Buildings, Waterfront, Castries	• Make sure that Tourist based amenities are included in the designs and are constructed. • Ensures that Tourism Interest on the West Coast Road are not disadvantaged during Construction.	Must be satisfied that Tourism amenities are addressed in the design. Must be keep abreast of all developments during construction which will affect the Tourism sector	Design/Build	External	Supportive	2	3	No
Ministry of Economic Development	Chief Economist	• email • cell number	Email/Phone	Financial Administrative Centre, Waterfront	• Conduct payment based on request of consultant and DIPE • Acts as liaison entity between Donor/Funding	Must be kept abreast of all project developments which are likely to have implications for the loan or grant agreement.	Concept Development/Feasibility/Build/ Commissioning /Milestone Review/Lessons Learned.	External	Leading	4	5	Yes

					Agency and the DIPE							
Lucelec, WASCO, Digicel and FLOW/LIME (Utility Companies)	Managers	• email • cell number	Email/Phone	Various	• Remove obstruction related to their organizations after compensation have been paid	Must be party to the designs. Must be informed of any works during construction which will likely affect their infrastructure.	Design/Build	External	Cautious	3	4	Yes
District Representative	Elected Members of Parliament.	• email • cell number	Face to Face/Phone	Various	• Make sure the project is going based on the regulation, objective, and protecting the interest of community	Must be kept abreast of all developments during the elaboration of the project.	Design/Build	External	Supportive	3	5	Yes

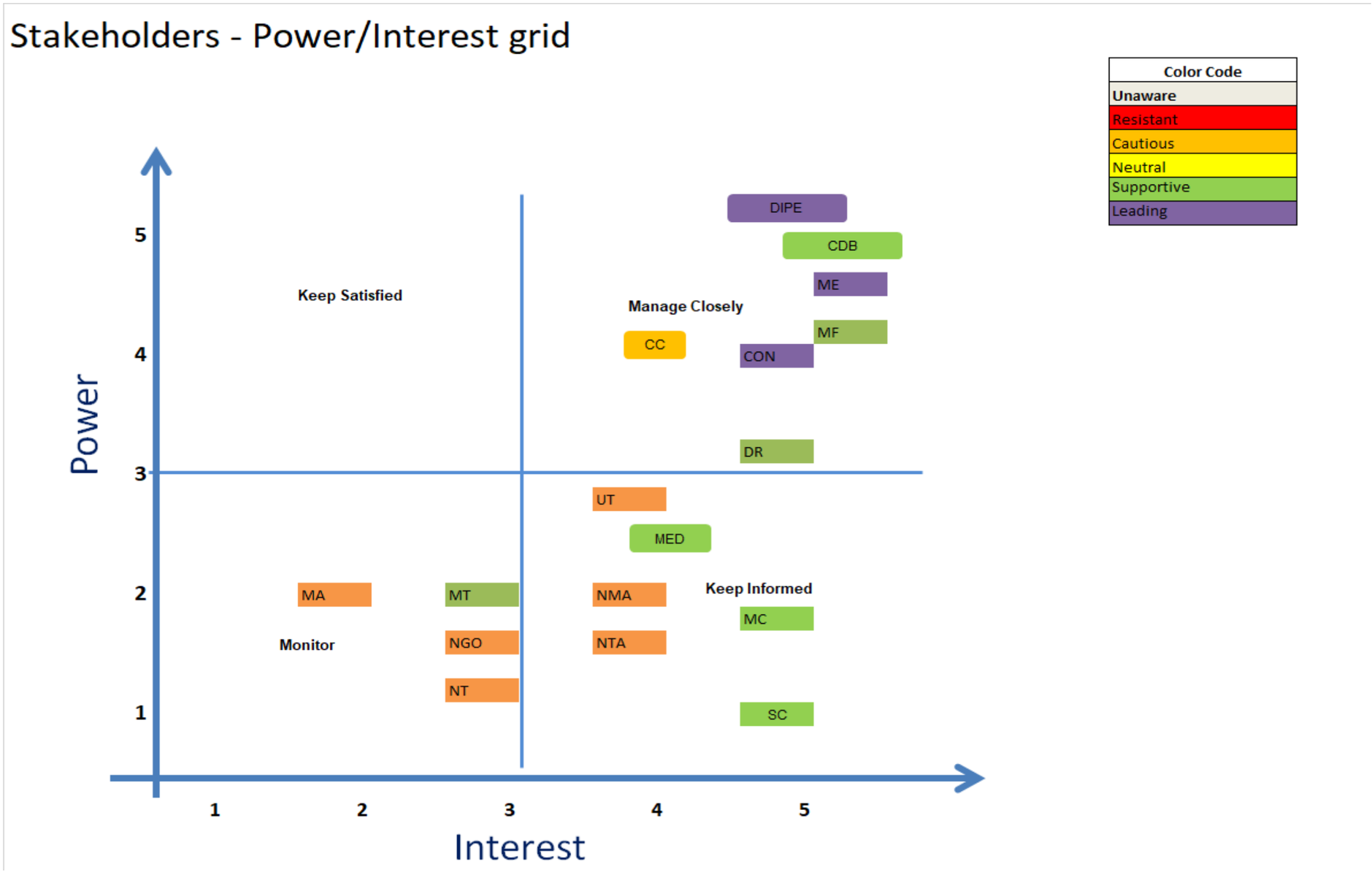


Figure 39. Stakeholder Power-Interest Grid (Source: A. Jn. Baptiste, 2019)

Key:

1.CON-Consultant

2.MC-Main Contractor

3.SC-Sub-contractor

4.CDB-Caribbean Development Bank

5.CC-Constituency Council/Community

6.NT-National Trust

7.NGO-Non-Governmental Organization

8.MED-Media

9.MA-Ministry of Agriculture

10.NMA-National Minibus Association

11.NTA-National Taxis Association

12.MF-Ministry of Finance

13.MT-Ministry of Tourism

14.ME-Ministry of Economic Development

15.UT-Utilities

16.DR-District Representative

4.10.3 Stakeholder Engagement

The DIPE will seek to involve the key stakeholders, including the local community during the planning, construction, operation and decommissioning of the Project. In particular, the DIPE will seek to understand and address local community concerns about the environmental and social impacts of the Project's activities. A proactive and open approach to stakeholder engagement will be undertaken as part of Project.

The following key principles will apply to all Project engagement and communication:

- a proactive approach to stakeholder engagement will be applied;
- respect will be shown at all times;
- ensure a two-way conversation between the DIPE and the key stakeholders;
- develop local community understanding of the opportunities and benefits of the Project;
- maintain regular contact and engagement with the key stakeholders;
- provide feedback to the key stakeholders on how their input has informed decisions; and
- record all significant contact with key stakeholders.

The key local stakeholder groups, their primary interests and the range of engagement mechanisms DIPE will use throughout the Project are outlined in the Chart 53 below.

Chart 53. Local Stakeholder Engagement Mechanisms (Source: A. Jn. Baptiste, 2019)

Stakeholder Group	Primary Interest	Engagement Mechanisms
Local Landholders	• Effects on farming practices and livelihoods • Property acquisition and relocation • Compensation agreements • Property values • Access and connectivity • Social networks and connections • Dust, noise, light & amenity • Traffic • Vegetation clearing	• Individual meetings on affected properties • Community Reference Group • Property acquisition through land valuator • Dedicated Community Liaison Officer • Dedicated project phone number and email address • Project site office • Personal telephone calls, letters, emails • Bi weekly newsletters • Results of environmental
Resident community	• Job and business opportunities • Education and training opportunities • Community cohesion and social values • Dust and noise • Integration of workforce • Access to social services • Traffic and congestion	• Community information sessions • Community Reference Group • Biweekly community newsletter • Project site office • Dedicated project phone number and email address • GOSL Website • Participation in local events

The Stakeholder Management Plan details the objectives, strategies and integrated activities for the Project involving:

- communication tools;
- community and stakeholder engagement;
- media and information program; and
- Community program.

4.10.4 Key Messages

Key messages are the broad themes woven into all verbal and written communication. The use of agreed key messages throughout all project communication is essential to ensure consistency of message by all, consistency with other agency messaging and to reinforce key program themes.

The key messages for the program are:

- DIPE is repairing the Piat road, and other related infrastructure in order to provide the community with quality roads.
- The FAARPII program of projects is one of the largest civil engineering program of work to be undertaken by the DIPE in recent times.
- DIPE is working closely with the Department of the Prime Minister and Cabinet, Ministry of Finance and other agencies to ensure an effective, timely and coordinated reconstruction effort in the instance of the Piat road.
- Key agencies are working to keep traffic moving. Plan ahead, stay informed and allow extra time. Find out the latest road information from the DIPE's hotline.
- The DIPE's program of work for the infrastructure rebuild will be ongoing for around four months and is expected to cost in the order of $1.9 million.
- DIPE is creating resilient infrastructure that gives people security and confidence in the future of the community.

- The reconstruction is a challenging task and some projects or areas of work will take priority over others. Determining which parts come first is complex and it is important that there is a robust and transparent planning process in place to drive the work program over the construction period.
- Safety is our number one priority. Safety is your responsibility too. Stay clear and stay alert - keep children and pets at a safe distance. Be on the lookout for changed traffic conditions and drive to the conditions. Stay within the speed limit.
- Alliance partnerships are a proven way of delivering the best results on infrastructure projects, including bringing innovation and value for money. All organizations involved commit to working closely together to achieve the best outcome for the community.
- The DIPE project team has a proven track record of working on infrastructure projects, understands the challenges and has the project and construction management capability to manage large-scale contract works.
- The people of Piat are at the heart of this rebuild. We'll give you as much notice before work as possible so you can plan ahead. You can contact us by phoning our hot line (number to be determined), emailing infrastructureforpiat@gosl.gov.lc or visiting the GOSL website.
- DIPE understands that our communities and businesses have been heavily impacted by poor road infrastructure and is committed to ensuring communities are impacted as little as possible during the rebuild process.
- DIPE thanks the people of Piat for your patience. We couldn’t’ do it without you.
- Thank you for welcoming us into your community.

4.10.5 Information Dissemination Methods

Chart 54. Information Dissemination Methods (Source: A. Jn. Baptiste, 2019)

Information Dissemination Method	Application
Correspondence by phone / email / Text / Instant message	• Distribute project information to government officials, organizations, agencies and companies • Inform stakeholders about consultation meetings
Print media	• Disseminate project information to public, and illiterate stakeholders • Inform the stakeholders about consultation meetings
Radio and television	• Prepare pubic information material including Q&A and a jingle in both English and Kweyol for radio and television public service announcements • Prepare biweekly advertisements to facilitate the
Website and social media	• Use the GOSL website to disseminate project information to large audiences, and stakeholders • Create a FAARPII Facebook page with information similar to the website
One-on-One interviews	• Solicit views and opinions • Build personal relations with stakeholders • Record interviews

Information Dissemination Method	Application
Formal meetings	• Present project information using Power Point presentations • Build impersonal relations with high level stakeholders • Distribute technical documents • Record discussion, comments/questions raised and responses
Public meetings	• Present project information to a large audience of stakeholders or to the community using Power Point presentations, posters, video or project information documents • Build relationships with the local community • Distribute non-technical project information
Focus group meetings	• Facilitate meeting in smaller group of between 8 and 15 people to provide their views and opinions of the Project • Record discussion, comment/questions raised and responses
Workshops	• Present project information to a group of stakeholders • Use participatory exercises to facilitate group discussions, brainstorm issues, analyses information, and develop recommendations and strategies

Information Dissemination Method	Application
Roundtable discussions	• Use prepared questions or gather preliminary questions to facilitate group discussions • Each person is given equal right to participate • Record responses
Surveys	• Gather opinions and views from individual stakeholders • Gather baseline data • Record data • Develop a baseline database for monitoring impacts
Site visit	• Gather opinions and views from individual stakeholders through visiting project site

4.10.6 Reporting

- **Objectives**

In both personal and business relationships, follow-through is important. The same principle applies to stakeholder engagement. Once consultations have taken place, stakeholders will want to know which of their suggestions will be used, what risk or impact mitigation measures will be put in place to address their concerns, and how, for example, project impacts are being monitored. Often the same methods used in information disclosure are applied to reporting back to stakeholders. This follow up can include large-scale forums, brochures, targeted meetings, and consultative committees.

- **Reporting to stakeholders**

Reporting to stakeholders involves providing important details on the undertakings, routines, status, and progress of the project team and the project progress. Reporting to stakeholders may also include new or corrected information since the last report. Keeping track of the many commitments made to various stakeholder groups at various times, and communicating progress made against these commitments on a regular basis, requires planning and organization. The methods and frequency of reporting to stakeholders are provided below in chart 55.

The DIPE is focused on ensuring a two-way conversation with stakeholders and the wider community and will actively seek feedback on the Project's impacts and benefits. Where possible, the Project team and those responsible for the design review and supervision will be directly involved in engagement activities and conversations with stakeholders to encourage a responsive approach to feedback. This method also assists in ground verification study findings and understanding stakeholder's preferred mitigation and management strategies as they are advised and integration of this feedback into the Environmental Impact Statement for the Project if relevant. Feedback will be provided to those submitting feedback at the most appropriate time.

Community feedback will be used to monitor the effectiveness of the Project's mitigation strategies and action plans. If feedback indicates a need to adjust the mitigation strategies and action plans the following process will be followed:

- community feedback on the mitigation measure will be reviewed further to better understand the issue;
- the feedback will be investigated further through discussions with stakeholders, community members, government agencies and other groups, field investigations, further technical monitoring or data collection as required; and
- following the investigation, recommendations will be made to the Project Manager regarding the appropriate course of action. If necessary, Action

Plans will be updated as needed and communicated to the relevant staff for implementation.

The DIPE is focused on ensuring a two-way conversation with stakeholders and the wider community and will actively seek feedback on the Project's impacts and benefits.

Chart 55. Methods and Frequency of Reporting to Stakeholders (Source: A. Jn. Baptiste, 2019)

Reporting Party	Reporting Method	Stakeholder	Reporting Information	Frequency
Project Steering Committee	Formal meetings	Government of St. Lucia	• Project status • Plans for next period • Issues and changes • Progress of the communication campaign	Monthly meeting
Government of St. Lucia	Public meetings	NGOs Local Community Private Interests	• Project status • Plans for next period • Issues and changes	Biweekly meeting
Project Steering Committee	Correspondence by email or postal mail	Government	• Project status • Issues and changes	When changes occur
Government of St. Lucia	Print media	NGOs Local Community Private Interests	• Project status • Issues and changes	When changes occur
Government of St. Lucia	Radio and television (English and Kweyol)	NGOs Local Community Private Interests	• Project status • Issues and changes	When changes occur
Government of St. Lucia	Website and social media	NGOs Local Community Private Interests	• Project status • Issues and changes	When changes occur

4.10.7 Complaint Resolution

To facilitate open communication and active complaint resolution, it is important that local stakeholders are able to raise issues and complaints in a formal way. The DIPE has a dedicated Communications Officer with whom local stakeholders can raise issues and concerns relating to the Project.

The Community Liaison Officer is available to receive complaints and can be contacted in person at the DIPE, by email or telephone. The Communications Officer ensures that all issues are conveyed to the appropriate sectors of DIPE, including DIPE management in the event an issue relates to operational issues.

Concerns and issues raised are recorded and responded to in a timely and consistent manner, and in accordance with regulatory standards and company policies. The following are key principles to be adhered to by DIPE in responding to issues or concerns raised by local stakeholders:

- timeliness – complaints will be dealt with in a timely and efficient manner;
- sensitivity – ensure that both parties feelings and perspectives are respected;
- fairness and impartiality – both parties will be afforded substantive and procedural fairness in the resolution process; and
- confidentiality – only parties directly involved in the complaint or those involved in decision making about outcomes will have access to information about the complaint.

4.10.8 Communication risk register

The table below outlines the key Project communication risks, risk rating, proposed risk management approach/communication methods, and treated risk rating. This list will continue to be updated throughout the life of the Project.

Chart 56. Communications Risk Register (Source: A. Jn. Baptiste, the author, September 2019).

Issue	Initial risk rating	Proposed management strategy/communication methods	Treated risk rating
Residents are unwilling to put up with high impact activities and ask to be temporarily accommodated elsewhere.	H	A protocol has been developed to manage this: DIPE Temporary Accommodation Protocol.	L
Rebuild fatigue means people are less patient and supportive of DIPE work.	H	Redouble communications effort: focus on what research tells us is most important to people; emphasize progress, and the end is in sight.	M
Confusion about who is responsible for works-DIPE/ Contractor.	M	Key messages have been created to explain how works is managed.	L
Property owners refuse permission for works to occur on their private property.	H	Keep liaison with Surveys Department. Ensure the tone of all communication is appropriate, i.e. respectful, helpful and uses plain language.	M
Complaints about the order in which works are undertaken i.e. prioritization of works	M	Key message about engineering benefits and facts that make the order appropriate and logical. Ensure there is justification provided in all public communication for why work is occurring in a particular area Ensure feedback is passed onto the design and construction team so that adjustments can be made if appropriate.	L
Frustration over delays to project start dates or delays in the midst of projects underway	M	Keep stakeholder well informed about the reasons for any delays and provide regular updates.	L
Expectations regarding the finished product e.g. full road replacement versus milling.	H	Key messages developed around construction decisions which explain how the type of intervention is determined.	M
Residents/stakeholders not advised in advance of works	M	Ensure no works occur without advance warning except emergency works Establish agreed levels of service and ensure these are adhered to by all contractors Use a variety of communication methods to help ensure the message gets through e.g. website, flyers.	M
Businesses negatively impacted by DIPE works	H	Ensure close liaison with businesses, and their needs are addressed where possible.	M
People with special needs having essential services (e.g. power, water) or access cut	H	Promote the emergency contact number (hotline) Develop a register of residents and businesses for whom underground services and access are critical. Consult this prior to carrying out the works so appropriate alternative arrangements can be made. Continue to update this list as required.	M
Safety, particularly for children and pets	H	Include a key message about safety in all project communication Develop a campaign to ensure safety is promoted throughout schools.	M

Consultation fatigue	H	Enable stakeholders to 'opt out' of receiving information Take the temperature' of the community via ad hoc conversations Keep information simple and focused and in a format that suits them Ensure major communication activities are made known to other rebuild organizations and that DIPE is aware of their activities to identify synergies and avoid over consultation.	L
Active elected representatives	H	Monitor media coverage of the works in general Liaise regularly with community leaders Ensure the district representative and key community members are given up-to-date information about the project and are welcomed as guests.	M
DIPE messages inconsistent with Department of Prime Minister and Cabinet	M	Ensure close liaison with Department of Prime Minister and Cabinet.	L
Accusations of the communication tools/approach being wasteful of taxpayers' money	M	Ensure the team adopts a 'value for money' approach to all decisions and avoid promotion/marketing that costs money. Rely instead on DIPE's good work to speak for itself Ensure all communication collateral has a clearly defined need and that no existing tools exist that could be used instead.	L
DIPE work conflicts with or interferes with private residence repairs	M	Use multiple channels to advise affected residents e.g. work notices, email and door knocking Ensure sufficient notice is given to enable the community and business to plan around DIPE activities.	L
Perception of potential damage to private residences from compaction activities/ other activities	H	A process has been developed and to be communicated to the project team and contractor to ensure these risks are identified early and a consistent process is followed. Monitoring will be implemented if deemed necessary.	M
Inconsistent responses to public queries across different project areas	M	Use the project hotline/project site office as the first point of contact for all queries Write standard Q and As, ensure they are kept up to date according to any newly identified issues or requests for information and that these are used to provide any responses.	L
Language and literacy barriers	M	Ensure plain language is used in all communication. Include a glossary of terms on the GOSL. Ensure the use of Kweyol as much as possible in local communication.	L
Formal consultation for projects impacts on works scheduling	M	Monitor the works program and be ready to implement consultation if needed	L

4.10.9 Work Notices

Work Notices will be distributed to affected residences/businesses before work is undertaken in any area. The goal is for the community to be notified of works affecting them at least three days prior to the works, and longer for major works such as road closures:

Chart 57. Notices (Source: A. Jn. Baptiste, the author, September 2019)

Stakeholder required	Notice
Resident- LOW impact work	3 days
Resident - HIGH impact work	7- 10 days (+face to face where possible)
Sensitive stakeholder (business, school etc.)-LOW	7 days (+face to face where possible)
Sensitive stakeholder (business, school etc.) -HIGH	7- 10 days (+face to face info gathering on impacts)

The Notices will detail the nature and timing of the works, any potential impacts, explain the necessity of the works, and provide project contact details.

These notices will be distributed by hand in person to businesses, loaded onto the GOSL website, and emailed to the stakeholder distribution list. A template will be developed that is to be used for all work notices as it is critical that written communication is consistent in look and written style. All project team members are required to adhere to the template**;** however, it should be noted that there is considerable flexibility regarding how the content is presented.

4.10.11 Traffic Management

The Construction Management Plan details how DIPE will manage temporary traffic impacts.

Forewarning the public and all key stakeholders of expected traffic delays and disruption will be a critical part of keeping people informed. Traffic impacts will be detailed in relevant public communication about project works. In the case of significant changes, a media release may be appropriate. Weekly traffic updates are produced and distributed to key stakeholders including media.

It is vital that information about traffic management is correct in all written communication, so all communication material must be checked and approved by the relevant traffic manager prior to its public release.

A key message will be used extensively in project communication urging people to "be on the lookout for changed traffic conditions and drive to the conditions. Allow for possible detours and delays to your journey." Reference will also be made to the GOSL website where users can find out about roadworks.

4.10.10 Monitoring and Evaluation.

- **Monitoring**

DIPE is committed to monitoring its performance and identifying opportunities for improvement or areas where a different approach might be needed for communication. It will be critical to continually monitor and evaluate the effectiveness of the communication and engagement program with the local stakeholders in order to ensure impacts and concerns raised are considered and acted upon where appropriate.

- **Evaluation Methods**

A number of methods will be used to evaluate the effectiveness of the engagement program with stakeholders. These methods include:

- **Database records:** Database records with an analysis of feedback forms submitted, telephone calls, incoming emails, tone of enquiries and key issues raised.
- **Benchmarking activities:** Benchmarking activities will be undertaken using questions on any feedback forms and activities to determine changes in local community attitude, knowledge and behaviours.
- **Informal feedback:** All significant informal feedback received from stakeholders regarding consultation activities will be recorded in the revised Project database and reported and analysed.
- **Observations:** Team members will record their observations during stakeholder engagement activities. These observations will detail what happened during the activity, who was involved and how they reacted. Team members will also record 'stand out moments.
- **Media analysis:** Analysis of negative versus positive media coverage.

4.10.12 Evaluation criteria

The evaluation criteria for each objective are identified below.

Chart 58. Evaluation criteria (Source: A. Jn. Baptiste, 2019)

Objective	Method of evaluation	Key indicators
1. Inform the stakeholders about Project benefits and opportunities	• Database records • Benchmarking activities • Informal feedback • Observations	• Level of stakeholder awareness of the Project • Information disseminated as

Objective	Method of evaluation	Key indicators
2. Provide open, honest and timely communication with stakeholders	• Database records • Benchmarking activities • Informal feedback	• Amount of communication with stakeholders and its effectiveness • Stakeholders satisfaction levels with the Project communication

4.10.13 Stakeholder Plan Updates

Note that the Stakeholder Management Plan and associated documents are not static. The stakeholders identified and their information documented in the Stakeholder Register will be reviewed at least biweekly to ensure the plan is meeting project expectations and to make modifications if required.

4.10.14 Approval

Approved by:

_____ Date:_____

Permanent Secretary-DIPE

Executive Sponsor

_____ Date:_____

Chief Engineer-DIPE

Project Manager

4.11 Health, Safety and Environmental Management Plan

4.11.1 Purpose

The purpose of this Plan is to ensure that works conducted under FAARPII are compliant with Health, Safety and Environmental Policy and Procedures by providing project personnel with a process, which enables them to comply with existing Labour and Environmental Laws.

- Health and Safety Act, Saint Lucia
- Health and Safety Regulations, Saint Lucia
- Environment Protection and Biodiversity Conservation Act, Saint Lucia
- Environmental Management and Pollution Control Act, Saint Lucia

4.11.2 Key Responsibilities

The Project Manager is responsible for the following activities:

- Identifying hazards and assessing the risks associated with the work, and documenting the risk control measures to be taken
- Managing compliance with Work Health and Safety (WHS) and workplace injury;
- Managing worker's compensation legislation, regulations, standards and codes, Safe Work Method Statements and the Site Safety Rules;
- Assessing and monitoring the capability of service providers in the supply chain, and verifying that they meet WHS requirements;
- Providing service providers in the contract chain with the Health and Safety & Environmental Management Plan (EMP)and any updates; and
- Managing communication and consultation provisions in accordance with the regulatory and other requirements.
- Ensuring plant operators have certificates of competency;

- Ensuring that before commencing work on site all personnel have attended suitable induction and/or undergone relevant Health and Safety training;

The Contractor is responsible for:

- Implementing the Site-Specific Safety and Environmental Management Plan;
- Displaying and making Site Safety Rules available to personnel on, and visitors to, the works site;
- Conducting site-specific induction, specific work activity safety training and refresher training;
- implementing workplace injury, illness and emergency management processes in accordance with established procedures;
- Preparing, maintaining and making accessible the register of hazardous chemicals;
- Maintaining first aid stocks and providing first aid;
- Consulting with the Resident Engineer as necessary, if any potential hazards are detected which have not been planned for;
- Co-ordinate with other parties on site and restrict access to work areas, as needed;
- Issuing of protective clothing and equipment, if needed;
- Ensuring appropriate Safe Work Method Statements and other safe operating procedures are followed;
- Maintaining and making accessible the Register of Hazardous Substances;
- Planning traffic and plant movement;
- Planning materials handling to avoid heavy manual lifting, where practicable; and
- Maintaining EMP and WHS records

Team members are responsible for:

- Working in a safe manner without risk to themselves and others;
- Complying with this Plan including all WHS and environmental protection measures;
- Reporting any new identified hazards to the Resident Engineer;
- Reporting all incidents to the Resident Engineer;
- Reporting all injuries and illnesses to the designated First Aid Officer;
- Reporting any WHS hazards to the Resident Engineer;
- Providing suggestion, through agreed consultation methods, on how to improve WHS and Environmental Management issues;
- Seeking assistance if unsure of WHS requirements;
- Reporting any faulty tools or plant to the Resident Engineer;
- Complying with site safety rules;
- Correctly using all personal protective equipment; and
- Complying with emergency and evacuation procedures.

4.11.3 Reporting

Bi weekly reporting to the DIPE so as to update the current plan and to provide a record of health, safety and environmental management incidents.

4.11.4 Compliance Obligation – Legal and Other Requirements

The project manager will ensure that any approvals, licenses and permits as required by Legislation, Codes of Practice and/or Standards are obtained before any works commence on this Project.

The following objectives and targets are set up for this project.

Chart 59. Health, Safety and Environmental Targets (Source: A. Jn. Baptiste, 2019)

NO	Objective	Target	Performance Indicator
1	Effective communication and consultation	Toolbox meetings; Fortnightly or as determined by the Project	Regular meeting held and
2	Community complaints responded to promptly	100% of complaints closed out within 5 working days	100% close out
3	WHS and Environmental legal	No penalties or notices received	Zero
4	Workplace WHS and Environmental	100% of planned inspections carried out	100%
5	WHS and Environmental	100% of employees & subcontractors are	100%

4.11.5 Communications

The project Manager is the contact point for all health, safety, environmental matters and emergencies on site and he is responsible for ensuring all such issues are resolved.

Regular site meetings (weekly or as required), are to be held to discuss Project progress and actual outputs against targets; and to discuss other issues such as incidents/accidents, near misses, non-conformances, corrective actions and improvements.

Emerging safety, environmental and quality issues on site are discussed and consulted through regular toolbox meetings run by the Resident Engineer and recorded in a standard format.

Work team members are required to notify the Resident Engineer of any health, safety and environmental issues on site.

4.11.6 Complaints

Any complaints concerning any aspect of the Project are registered, investigated and recorded on the Communications and Complaints Register which details the nature of the complaint, the complainant and actions taken as a result of the investigation. It cross-references any Non-Conformance reports or other relevant documentation.

If an environmental complaint (such as a complaint regarding noise or pollution) is received, a written report will be prepared and given to the Contractor or DIPE's representative within one (1) working day. This report includes details of the complaint, action taken to correct the problem and proposed measures to prevent the occurrence of a similar incident.

The project manager ensures that all complaints received are recorded, investigated promptly and that appropriate action is taken to resolve within a target date of 5 working days.

4.11.6 Workplace Health and Safety

4.11.6.1 The Policy

The Work Health and Safety Policy is to protect workers and others at various workplaces from work-related injury and ill health and to comply with all relevant Work health and Safety legislation.

The DIPE is committed to:

- complying with statutory requirements, codes, standards and guidelines;
- providing a safe and healthy workplace for all its workers, contractors, and visitors to its premises as well as to the premises of its customers;
- defining roles and responsibilities for work health and safety;

- setting up objectives and targets with the aim of eliminating work related incidents in relation to our activities, products and services;
- using safe working systems supported by documented safe working procedures and will only use materials that are safe and do not pose a risk to the environment; and
- consulting with workers, contractors and our clients to improve decision-making on Work Health and Safety matters.

The project manager will implement this Policy, being responsible for the health and safety of all persons

Workers are responsible to take care of their own health and safety and that of their fellow workers to the extent of their capability by following all safety rules, procedures and instructions.

All incidents however minor are to be reported to contract management so that appropriate action can be undertaken to prevent a repetition or to minimize the risk.

This Health, Safety & Environment Management Plan identifies and assesses all hazards associated with the works and control measures to be implemented to ensure that workers working on site, members of the public and visitors to the site are adequately protected from risk of harm, injury or illness.

4.11.6.2 Site Safety Rules

The contractor shall establish site safety rules to safeguard the health and safety of all its workers.

All workers, subcontractors, suppliers and visitors to the site must abide by the identified site safety rules. A copy of these rules will be given during site induction. Furthermore, the rules will be displayed on notice boards or at other suitable locations on the work site.

4.11.6.3 Health and Safety Site Inspections

The Resident Engineer conducts daily safety inspections using *an approved* Inspection Checklist on the construction site to monitor the performance of safety controls implemented on site. Any actions resulting from the inspections are promptly resolved.

4.11.6.4 Inductions and Training

The Construction Manager ensures that all personnel and subcontractors working on site have attended all induction training as required by WHS regulations namely:

- general construction induction training;
- workplace specific training; and
- task-specific induction training.

Workplace Specific Training aims to provide information about work, health and safety issues and safe work practices that are specific to the construction workplace. This training is delivered by the Construction Manager (or delegated officer) to his workers commencing work on the construction site.

All Project personnel including subcontractors will receive site induction training, which covers:

- Emergency and response procedures on site;
- Environmental awareness of their environmental protection responsibilities and measures to minimize environmental impacts;
- Environmental Protection Requirements of the site.

Informal training through toolbox meetings is also delivered when required on specific safety and environmental topics which may include fatigue, manual handling, confined space, erosion and sedimentation control, protection of heritage items, protection of native vegetation and other environment issues relevant to the site.

Only workers who have attended this induction will be permitted onto the jobsite. Records of site induction training will be kept on the Site Induction Register. The Task Specific Induction Training is provided to communicate hazards and risk controls and to provide the skills necessary for workers to carry out a specific task safely. Relevant induction is given as above, before a worker can commence work on site.

Visitors to construction workplaces are site inducted and must be accompanied around the workplace by an authorized person. All personnel on site must have the minimum Work Health and Safety Training requirements.

A hard copy of all documents and records are kept at the Project Management Office located at the DIPE's Headquarters. There is also a copy of all documents and records at the site office.

4.11.6.5 Incident Management

The Resident Engineer is responsible for managing the incident response according to the following procedures. The Resident Engineer is the first point of contact when an incident or accident occurs. All incidents and accidents are reported immediately to the Resident Engineer.

Back up for the Resident Engineer is provided by the Project Manager.

Emergency contact numbers for the Project are always displayed on relevant site notice boards and informed during site inductions.

The DIPE maintains records of incidents and injuries in accordance with statutory requirements.

4.11.6.6 Emergency Preparedness and Response Procedures

Preparation for emergency situations aims to minimize the nature and extent of injuries, damage to property and harm to the environment that might ensue from an emergency situation.

The purpose of emergency preparedness is making sure that emergency procedures work in the event of an emergency.

An emergency response plan must be prepared for the worksite. It is to be prepared by the Contractor and Resident Engineer and approved by the Project Manager. The plan is displayed on relevant notice boards and informed during site inductions.

Minor Incidents

- minor injuries will be attended to by the First Aid Officer/s. First aid kits are located in the site office and/or Contractor's Site Supervisor's vehicle.
- if further treatment is required (e.g. X-Rays, injections), arrangements will be made through the Resident Engineer or Project Manager

Serious Incidents

- Unless in danger of further injury do not move the injured person.
- Notify a first aid officer to attend to the injured person.
- If an ambulance is required, call 911. The site address, telephone number, (details of which are posted on the notice boards) and injury details must be given accurately to the emergency service. The exact location of the injured person shall be given to the operator.
- Reassure and keep the injured person warm until help arrives.
- Ensure that someone is available at the site to meet the Ambulance and direct it to the injured person. Ensure clear access is available to the ambulance to get as close as possible to the injured person.
- Notify the Project Manager and/or Resident Engineer as soon as possible.

4.11.6.7 Fire Response

- Warn and rescue any person in immediate danger - only if safe to do so!

- Call the fire brigade on 911.
- Extinguish the fire using the correct fire extinguisher if safe to do so
- Evacuate to the emergency assembly area if directed or in danger.
- Remain at the assembly area and ensure everybody is accounted for.

4.11.6.8 First Aid Arrangements

The Contractor shall provide training for first aiders through the local Red Cross.

Due to the nature of the work (construction work), first aid shall be available on site and Construction Site Supervisor/Resident Engineer's vehicle.

Project Manager, Resident Engineer and Construction Site Supervisors are responsible for:

- Assessing the first aid needs of their area and staff, including the administration of first aid.
- Conducting a risk assessment for any special needs item prior to inclusion into the first aid kit.

First aid attendants are responsible for the timely maintenance of first aid kits including ordering stocks/re-stocking, cleanliness, suitability of the kit for the works, and availability.

4.11.6.9 Incident Investigations

For all incidents involving near misses, property/plant damage or injury to the public or the environment, the DIPE investigates and records the details in an Incident Investigation Report.

Notifiable Incidents

The Resident Engineer reports all notifiable incidents to the Project Manager and to the relevant Authority. Where such an incident has occurred, the Resident

Engineer considers whether the site needs to be preserved for investigation by the relevant authority. Reporting occurs as per timeframes detailed below:

Chart 60. Reporting Frequency for notifiable Incidents (Source: A. Jn. Baptiste, 2019)

Notifiable incidents	Report to:	Timeframe
Serious incidents involving a death (fatality) or a serious injury or illness	WHS Regulator/Police	Immediately
	Scheme/Insurer	Within 48hrs
Serious incidents involving injury or illness to non- workers at the workplace	WHS Regulator	Immediately
Other incidents involving an injury or illness where worker's compensation is payable	Scheme Agent/Insurer	Within 48hrs

4.11.6.10 Hazard Identification and Risk Control

DIPE requires that a thorough hazard control process, comprising hazard identification, risk assessment and analysis, be conducted before work commences to have appropriate safety controls measures in place from the start of the Project.

An initial worksite Work, Health and Safety hazard identification and risk assessment is carried out by the working team and documented before works commence. The risk control measures are then implemented at the workplace and explained to workers on the Project. A Hazard Identification Checklist shall be used as a guide to help identify all hazards at the workplace.

Risk assessment meetings are held with the Project delivery team to involve them in documenting the sequence of work activities and identifying critical Work, Health and Safety hazards that may result in illness or injury, to assess the risks and discuss and agree on appropriate Work, Health and Safety controls for the Project.

This initial risk assessment produces the Project hazard register; this is updated throughout the life of the Project, through subsequent risk assessment meetings or reviews where required.

The risk assessment process also identifies tasks that require the development of safe work method statements.

To be classified as high risk, relevant construction works have one of the following characteristics:

- In or near a shaft or trench depth greater than 1.5 meters
- Potential to fall greater than two meters
- Work near moving plant
- Work near traffic corridors (road, railway, shipping lane)
- Work needing temporary support to prevent collapse
- Work on or near energized electrical installations or services

4.11.6.11 Hazard Reporting

All workers shall report hazards immediately to the Resident engineer.

The Resident Engineer investigates all reported hazards and implements control measures to eliminate and/or minimize the likelihood of an incident or injury. The Project Manager regularly reviews and evaluates the effectiveness of control measures until the hazard is addressed and/or all risks have been mitigated or reduced.

4.11.6.12 Plant and Equipment

DIPE requires that all plant and equipment is inspected and maintained in accordance with the relevant standards and manufacturer’s recommendations.

Daily pre-start checks are carried out on plant and schedule of maintenance and fault reports are notified to the Resident Engineer and documented in logbooks

Where plant and equipment are hired, the above requirements apply.

4.11.6.13 Maintenance Procedures

Daily visual inspections are carried out by the Site Supervisor.

To demonstrate compliance with the plan, the Civil Works Manager conducts weekly and after rain environmental inspections on the construction site to monitor the performance of environmental controls implemented on site. Any actions resulting from the inspections are promptly resolved.

4.11.6.14 Traffic Management

Traffic management is required to manage vehicles, cyclists and pedestrian around the construction site to ensure their safety.

To maintain pedestrian and vehicular safety during construction relevant safety control measures to be implemented may include:

- A Traffic Controller will be used to direct pedestrians, cyclists and vehicles when construction vehicles are entering or leaving the site. Traffic controllers must have completed an accredited relevant training course.
- When partial road closures are required, a Traffic Control Plan will be documented to manage traffic around the site. The contractor shall prepare the plan and it will be vetted by the Resident Engineer.
- Where required to manage the safety of workers on foot in the vicinity of mobile plant and trucks, a Traffic Control Plan which includes a pedestrian and vehicle movement plan will be documented.

The Traffic Control Plan will be prepared by the Contractor and Resident Engineer and approved by the Project Manager.

4.11.6.15 Non-Conformity and Corrective Action

A non-conformance occurs when a procedure or environmental safeguard is not followed, or does not perform as required by this plan. The Project Manager will monitor non-conformances and initiate a corrective action where required.

Corrective action seeks to eliminate the cause of nonconformities to prevent recurrence or occurs elsewhere. In particular, corrective action seeks to:

- review nonconformities;
- discover and eliminate the underlying cause of problems and non-conformance;
- determine if similar nonconformities exist, or could potentially occur;
- provide recorded evidence of the problems being addressed;
- provide a record of the events and circumstances that inform decisions and direct changes to the system;
- determine and implement the corrective action needed;
- review the corrective action taken; and
- ensure that senior management is made aware of all of these factors.

4.11.6.16 Work Health and safety Dispute Resolution

If the procedure for settling disputes or issues about WHS issues (other than injury management issues) cannot be resolved after discussion between the parties (Contractor and DIPE), the parties must make reasonable efforts to achieve a timely, final and effective resolution of the issue in accordance with the following procedure:

1. any party to the issue may commence the procedure by informing each other party that there is an issue to be resolved; and the nature and scope of the issue.
2. as soon as parties are informed of the issue, all parties must meet or communicate with each other to attempt to resolve the issue.
3. the parties must have regard to all relevant matters, including the following:

a) the degree and immediacy of risk to workers or other persons affected by the issue;

b) the number and location of workers and other persons affected by the issue;

c) the measures (both temporary and permanent) that must be implemented to resolve the issue;

d) who will be responsible for implementing the resolution measures

- a party may, in resolving the issue, be assisted or represented by a person nominated by the party.
- if the issue is resolved, details of the issue and its resolution must be set out in a written agreement if any party to the issue requests this.

Note: Under the Act, parties to an issue include a person conducting a business or undertaking, a worker and a health and safety representative, and/or representatives of these persons.

4. if a written agreement is prepared all parties to the issue must be satisfied that the agreement reflects the resolution of the issue.
5. a copy of the written agreement must be given to:

   (a) all parties to the issue; and

   (b) if requested and as relevant, to the health and safety committee for the workplace.
6. to avoid doubt, nothing in this procedure prevents a worker from bringing a work health and safety issue to the attention of the worker's health and safety representative.

If the issue remains unresolved, a party may ask the WHS regulator to appoint an inspector to attend the workplace to assist in resolving the issue.

The Issue Resolution Procedure is displayed at relevant notice boards.

4.11.7 Environmental Management Plan

4.11.7.1 Objectives

The general environmental objectives include:

- To reduce or eliminate the release of pollutants to the environment e.g. dust.
- To reduce waste and resource depletion by utilizing recycling principles where practical.
- To implement site layout plan for control of any soil sediment running into storm water drains /pipes.
- To minimize impacts on the local community during works by communicating Project progress to all stakeholders.

The Environmental Management Plan (EMP) is the essential link between the environmental impacts assessment and Project activities. It is to ensure that environmental impacts identified during the assessment stage are properly managed on site and control measures are implemented.

The following client-supplied documents set out the contract environmental requirements:

- Works Specifications;
- Review of Environmental Factors (REF)

The Environmental Management Plan relevant to this Project as Developed by the Design Review Consultant will be used.

Environmental Responsibilities

The person with primary responsibility for implementing the EMP, monitoring its effectiveness and rectifying any deficiencies is the Project Manager. The Project Manager can delegate responsibilities to other members of the team.

The Project Resident Engineer will:

- monitor EMP performance, compliance and risk management on work sites. Report issues to the Contractor and Project Manager;
- ensure that all staff, subcontractors and visitors are properly inducted;
- ensure that staff and subcontractors are adequately trained for their allocated tasks;
- ensure that all plant and equipment is appropriately inspected and maintained;
- notify the Project Manager of any incident or accident;
- conduct or participate in incident/accident investigations;
- assist with weekly EMP site inspections;
- ensure that an up-to-date register is maintained for hazardous substances stored and used on site;
- assess the risks of any hazardous substances proposed to be brought onto the site.

4.11.7.2 Environmental Protection Requirements

The environmental protection measures cover three distinct phases of activity in accordance with the sequence of operations. These are requirements identified in the REF or other similar document provided by the DIPE:

- prior to construction;
- during construction and
- post construction. (but not including operation)

The Project manager is responsible for implementing the environmental safeguards detailed in the EMP.

All environmental incidents are dealt with promptly to minimize any potential impacts. Unexpected or accidental environmental incidents will be managed in

accordance with the site's incident response procedures. All environmental incidents are reported using a standard *Environmental Incident Report.*

Likely emergencies and incidents may involve:

- fuel or chemical spills;
- unlicensed discharge of pollutants to environment (air, water, noise, soil);

The Contractor is responsible for undertaking the incident response.

Chemical Spill Response**:**

Spills on the worksite are most likely to be hydraulic oil line burst or fuel oil spilled from plant items. If a spillage occurs the following procedure is to be followed:

- immediately identify the spilled material and notify the Contractor's Works Supervisor;
- contain the spill as soon as possible so it doesn't spread.
- if containment is required, contain using earth mound and/or absorbent socks/spill kit;
- use the relevant clean up procedure as instructed by standard operating procedures;
- once the spill has been contained, the Supervisor will arrange removal and disposal as soon as possible. All material is disposed of and records of disposal are to be kept on site;
- Environmental Incident Report is completed and forwarded to the Project Manager.

Any incidents on site which are likely to cause material harm to the environment, will be immediately reported to the Contractor and Resident Engineer.

The Environmental Protection Authority (Ministry of Sustainable Development) will be notified of pollution incidents on or around the site, which have occurred in the course of the works, in the following instances:

- the actual or potential harm to the health or safety of human beings or ecosystem is not trivial;
- the actual or potential loss or property damage (including clean-up costs) associated with a pollution incident exceeds $ 10,000.00

4.11.7.3 Environmental Rules

The following control measures will be adopted to minimize and manage waste in the Project:

- wastes will be stored in a manner that does not pose harm to the environment;
- any contaminated soil will be classified and disposed of to a legally operating waste management facility-the Governments' Landfill at Deglos;
- spoilt material that cannot be reused on site, will be disposed to an appropriate waste management facility;
- vehicles used for transportation will be securely covered to prevent waste spillage during removal; when leaving site travelling to the approved waste facility
- storage containers will be secured on vehicles;
- only compatible wastes will be transported together;
- waste will be disposed of at the Government's Landfill at Deglos.

4.11.7.4 Environmental Site Inspections

To demonstrate compliance with the EMP, the Resident Engineer conducts weekly and after rain inspections on the construction site to monitor the performance of environmental controls implemented on site. Any actions resulting from the inspections are promptly resolved.

4.11.7.5 Review of Environmental Management Performance

The Project Manager ensures that environmental performance is evaluated on a regular basis by reviewing inspections records, complaints/enquiries received, incidents and any other environmental issues.

4.11.7.6 Environmental Records

Environmental records are retained, complying with environmental legislation, standards and contractual requirements. Accurate and well-maintained records provide evidence that the Contractor and by extension DIPE is effectively managing its environmental responsibilities.

The Resident Engineer is responsible to maintain all Project documentation including records generated during the implementation of the Project.

4.11.7.7 Approval

Approved by:

_____ Date:_____

Permanent Secretary-DIPE

Executive Sponsor

_____ Date:_____

Chief Engineer-DIPE

Project Manager

CONCLUSIONS

The Feeder and Agricultural Roads Project Phase II as conceptualized will bring tremendous relief to the farmers of this country when implemented. However, to effectively realize the benefits of this project it is necessary that a robust Project Management Plan be developed. This research document has addressed this requirement by adopting the best practices outlined in the Project Management's Institute's PMBOK® Guide Sixth Edition and the Construction Extension to the PMBOK® Guide.

In view of the broad scope of the project, to ensure interest across as wide a range of contractors as possible and as short a time of implementation as possible, the project was divided into numerous work packages. In developing the Project Management Plan for the project, the research focused on package one with the intention that the methodologies developed would be adopted for the other packages. This was deemed feasible as at the contract packages are similar in nature, scope and complexity.

Although historically, construction management has been used as a guiding principle at DIPE for road project implementation, the PMBOK® Guide 6th Edition provided a set of good project management practices for the development of a more encompassing project management plan, which can serve as the standard for project management at DIPE in the future. The author is confident that the approaches detailed in the PMBOK® can serve the DIPE well in ensuring efficiency, accountability and transparency for all projects in its project management processes going forward.

The FAARP II road construction project will simultaneously address the geography, site conditions, communities, physical environments, existing infrastructure, as well as a wide range of stakeholder requirements. The project will also involve team specialists and contractors. The project, like buildings, residential units, healthcare facilities, utility infrastructures, oil and gas, and other

industrial facilities may appear typical: however, it presents its own challenges and risks. This project will require the integration of engineering disciplines (civil, traffic structural, geotechnical, etc.) as well as interaction with technology and specialized equipment that demand unique construction techniques and methods. This is expected to contribute to unique subcontracting arrangements, special financing, risk insurance, compressed schedule timelines, sustainable infrastructure, complex logistics, adaptation to changing governmental regulations, and internal/external constraints, all of which have the potential for significant increases to project and capital costs.

The risks inherent in FAARP II, coupled with possible time-related damages, generates the need for several of the Knowledge Areas to be implemented with enhanced visibility as specialty services. This subset of construction management, referred to as project controls, includes technically advanced disciplines of planning and scheduling, cost management, risk management, document controls, and forensic analysis. Strong project controls services will prove to be a strong component in the success of the project.

In order to produce the deliverables for FAARP II, there is need to adhere to regulations and jurisdictional (local, global, or industry-specific) requirements, for example, civic laws and construction codes. In addition, since the project is concerned with improving the social, economic, and environmental factors of sustainability, reliability, and the welfare of the affected community a multidisciplinary team of financial, insurance, legal, design, safety and engineering specialists; construction teams of various trades; and an efficient supply chain for materials and equipment are needed in order to deliver the project.

A number of factors contribute to the complexity of the construction environment for FAARPII. These include construction technology to be applied and their impact on the application of project management, changes to the building environment through the use of construction equipment and materials, and the magnitude of stakeholders with varying project expectations (e.g., public taxpayers, regulatory agencies, governments, and environmental or community groups).

To ensure the success of FAARP II, the development team should carefully analyse the project to determine the complexities of stakeholder impact and potential project ambiguity (e.g., the possibility of emergent issues or situations due to feedback and characteristics of stakeholder interrelationships) before confirming commitments for scope, time, quality, safety, and cost. The analysis should integrate risk management to minimize impacts and improve opportunities for success. Otherwise the project could result in an uncertain scope of work, an inappropriate methodology for construction execution, and an ambiguous environment, and could fail in timely completion and budget expectation.

Navigating the workflows of the project team within the implementing organization is expected to be challenging. Navigating workflows across multiple project stakeholders (e.g., owners, developers, designers, engineers, contractors, product vendors, and government agencies) expands the complexity of this challenge. In addition, different organizational systems; interfaces between components; large pieces of equipment in confined work spaces with multiple work crews in close proximity; extensive detail and intricacies of elements; and efficient coordination, control, and monitoring increase the complexity of the project.

This project is expected to be challenging, however the Project Management Plan developed in this work, if followed, will improve the efficiency and effectiveness of the project (e.g., stakeholder analysis, risk registers, standard work breakdown structures, or cost aggregation for budgets).

This Project Management Plan seeks to improve the efficiency and effectiveness of the management of FAARP II and includes tools, techniques, procedures, processes, and lessons learned applicable to the construction industry.

It is worth noting that on completion of the Scope Management Plan, rigorous financial analysis was undertaken to ensure that adequate funds are set aside for the successful implementation of the project. The robust cost-planning proposal is very applicable to the current Ministry’s structure and once adequately activated this should spell well for financial security and overall success of the project.

Quality is crucial for project success and acceptance. Quality may also be costly but this cost may be kept to a minimum if proper planning is undertaken and integrated into the whole life cycle of construction. To ensure that quality is integrated into the Project Management Plan, customer expectations must clearly be documented and incorporated as inputs to the Quality Management Plan. The Quality Management Plan should focus on three key issues; requirements, metrics and control. These issues should be dealt with by addressing capability, capacity, knowledge, unique requirements, quality in relation to customer or end-user, suppliers, materials, construction processes and environment.

To ensure project success, people must be adequately managed, assigned task according to their strengths and rewarded for their efforts. Labour practices should be managed in such a way so as to avoid breaching of international human rights and labour standards. For the Human Resource Management Plan to be effective, employment practices should exclude race, religion and sex from selection procedures. Rule of law and respect should be promoted, and training opportunities established. The Human Resource Plan should adhere to local and international laws in such a way that people and the community can experience social and economic prosperity without endangering the environment or the profit/ benefit of the performing organization. All human resources required to complete the project must be identified and classified in a comprehensive list based on their roles and responsibilities. In addition, the project organization chart, the staffing management approach, and details identifying how the human resources must be managed throughout the project as detailed in the plan.

Communications is necessary for effective coordination. To ensure this the project team must follow the Communications Matrix developed cognizant of all project stakeholders (names/titles, information, format) throughout the project lifecycle, and ensuring that the information disseminated during the project is done so at the right time, in the right format, to the right people and by the right person. Clear lines of authority and reporting are important; and must be supported by a well-

structured organizational chart. While continuous work must be done to ensure that the Communication Plan evolves with the project needs over time, it must be kept clear at all times that communication with stakeholders is important for ensuring that correct and timely information is disseminated at the right time and through the right channels.

Failure to adequately plan for risk can have adverse impact on project success. Hence it is necessary to capture and classify project risks, so that effective risk responses could be planned through the development of a Risk Register along with the requisite risk analysis. In undertaking the Risk Analysis all risks must be assigned a degree of probability of occurrence based on their likelihood of impacting one or more project objectives. The severity of the impact determined the type of risk strategies to be employed and the level of contingencies to add to the project budget. Risk Management is one of the areas of unique potential for sustainability, especially because it allows a broad range of risks to be considered. The Risk Management Plan should allow for integration of the P5 or *PRiSM*® Methodology into a general Risk Breakdown Structure (RBS). Categories of Society (People), Environment (Planet) and Economic (Prosperity) along with process and product should be assessed to determine if a risk is present or an opportunity is there to be explored. Due to the limited scope of this research project this aspect of the Project Management Plan was not undertaken.

A good Procurement Management Plan is necessary to ensure transparency and fairness in the procurement of goods and services under the contract. Standard Project Management practices must be followed in identifying the project's procurement management approach; types of contracts used and contract approval process. The plan must be comprehensive in that it must also detail procurement risks and constraints, and how these issues, along with vendors, will be managed effectively.

The Stakeholder Management Plan is indispensable as it ensures that anyone who can influence or who will be affected by the project is identified and managed in a way that is in line with best practice. Stakeholders must be assessed to see who are most likely to positively or negatively impact the project or vice versa, according to their level of interest, ability to make changes to the scope and those that can be easily influenced. As the project evolves, the stakeholder management plan must be further developed to reflect project specific situations. The Stakeholder Management Plan should focus on tested project management literature such as the PMBOK® Guide and best practices in the Road Construction industry. In addition to the plan, which details how stakeholders will be identified, classified, managed and engaged throughout the project, the Stakeholder Register and Stakeholder Analysis and Level of Engagement must also be developed to provide more information for effective stakeholder engagement.

The Health and Safety Management Plan is very necessary for the wellbeing, both physical and emotional of the workers and persons in the affected communities. As such through this plan the project team ensures that the project is executed to standards which fully comply with the United Nations Sustainable Development Goals as they pertain to Worker Protection and Care for the Environment.

Change management for FAARP II cannot be overlooked as many projects either fail completely or are rendered less effective because the change management imperative is often overlooked and/or underestimated and is therefore not managed as an integral part of the planning and execution of the project(s) concerned. Projects are unique once-off change interventions aimed at effecting change, but the overriding focus is often on so-called mechanistic or “hard” project deliverables. An emphasis on goal completion on time, cost containment and quality often leads to the exclusion or neglect of “softer” issues of organizational change and their related dimensions. Proper change management is important and the absence of such management can have a negative impact on a project’s outcome. The importance of the appropriate

management of change dynamics for FAARP II must be stressed. This can pose a challenge to the project manager, in that it is essential for project managers consciously and deliberately to manage change, just as they manage other project deliverables. The management of all change dynamics facets throughout the project management life cycle is essential to ensure the successful achievement of project objectives. It is therefore most important to identify what constitutes change management in the project management domain for FAARP II and then consciously to manage these elements across the entire project life cycle to enhance project outcomes.

It is worthy to note that the project will be evaluated by the comparison of the planned indicators and the actual results. Some benchmarking and audit monitoring will be involved. The successful completion of the project will depend on the completion of the corresponding criteria detailed in this plan. The main person responsible for the monitoring of the project successful completion is the Project Manager but he may also delegate this responsibility to other team members.

It is necessary that the lessons learned during the project be captured in the form of methodological literature that can be presented to any interested parties and analytical findings that will remain data for inner usage.

The DIPE would do well to abide by the plans developed, not only for the success of FAARPII but for all future projects to ensure the following benefits:

- Effective decision taking
- A clear road map supported by a common set of processes that can be used over and over again for all projects. This will speed up the project initiation phase and ensure teams and stakeholders know what is expected of them so projects can be delivered more quickly and so save money.
- Project scope is controlled

- The DIPE knows what to expect. A project management method helps ensure that client and project team are in agreement on what will be delivered.
- Better problem resolution. The risk management processes of a project management method will ensure many risks can be anticipated and prepared for. The communication processes also mean no one is surprised if a risk does occur.
- Costs are controlled.
- Struggling projects are more quickly identified. Project management methods reveal those projects that have over-run on time or budget, or those that are no longer on track to deliver the expected benefits, so that they can be dealt with early on.
- A more motivated team – projects that are better controlled with fewer unexpected surprises are more enjoyable to work on. And a happier team will be better motivated and so work more effectively, saving time and money.

RECOMMENDATIONS

1. The DIPE should employ formal PMBOK® based Project Management strategies to increase the likelihood of project success in the completion of civil engineering projects.

2. The DIPE should develop standard project management initiation and planning documents prior to the execution of civil engineering projects.

3. Going forward the DIPE should standardize the use of the planning process and templates created during the development of the Project Management Plan for FAARPII-Package 1 for all future civil engineering projects valued in excess of $1,000,000.00.

4. All projects managed by DIPE should be headed by a project management team using developed standard project planning documents and tools tailored for the project.

5. The DIPE project management teams should exercise care and caution during the development of each subsidiary plan of the Project Management Plan to ensure that all planning subsets for each knowledge area or respective application area are thorough and accurate and are in accordance with the PMI's best practice.

6. Information management is a real challenge at DIPE. In view of this, Administration should encourage the development of an efficient document management and storage system, to organize and store all documents created for future use and review in respect of all future projects.

7.The Permanent Secretary of the DIPE should ensure that for all projects, the project management team be hired and in place prior to execution and ensure that this team conduct all project planning related activities in order to enhance the proper management of the project during its lifecycle.

8. DIPE should pursue PMP certification of all its engineers. PMP certification could also be considered as a requirement for employment of engineers in the future.

9. The DIPE should invest in continuous professional development of project staff in the area of project management.

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APPENDIX

Appendix 1: FGP Charter

PROJECT CHARTER	
Date	Project Name:
Issue date: Date 13th May,2019	Project Management Plan for the Government of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project-Phase II (FAARP II)
Knowledge Areas / Processes	Applicacion Area (Sector / Activity)
Project Management knowledge areas: 1. Integration Management 2. Scope Management 3. Schedule Management 4. Cost Management 5. Quality Management 6. Resource Management 7. Communications Management 8. Risk Management 9. Procurement Management 10. Stakeholder Management Process groups: • Initiating • Planning • Executing • Monitoring and Controlling • Closing	Construction
Start date	Finish date

13th, May ,2019	8th, November, 2019

Project Objectives (general and specific)

General objective:

To create a Project management Plan in conformity with the standards of the Project Management Institute to effectively manage phase II of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project.

Specific objectives:

Project Integration Management

1.To develop an Integration Management plan to create a project Charter to formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.

Project Scope Management

2.To create a Scope Management Plan to ensure that the boundaries of the project are well defined from the outset and monitored rigorously.

Project Schedule Management

3.To create a Schedule Management Plan to divide the project into tasks and create both a schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.

Project Cost Management

4.To create a Cost management Plan to define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that

the project is completed within budget.

Project Quality Management

5.To create a Quality Management Plan to identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its performance within the triple constraints of Time, Cost, and Quality.

Project Resource Management

6.To create a Resource Management Plan to identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.

Project Communications Management

7.To create a Communications Management Plan to describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.

Project Risk Management

8.To create a Risk Management Plan to help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.

Project Procurement Management

9.To create a Procurement Management Plan to describe how items will be procured during the project and the approach that will be used to manage vendors on the project to deliver results.

Project Stakeholder Management

10.To create a Stakeholder Management Plan to systematically identify, analyze, plan and implement actions designed to address, support, engage and manage all project

stakeholders.

Project purpose or justification (merit and expected results)

The project to develop the Project Management Plan for the Government of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project-Phase II (FAARP II) is required to effectively create the documents and identify the tools that will be used by the Project Management Team during the Executing, Monitoring and Controlling, and Closing processes.

In undertaking the Feeder and Agricultural Roads Rehabilitation Project – Phase II, the Government of Saint Lucia(GOSL) seeks to fulfill its mandate in improving the strength and general road riding conditions on the targeted roads. The GOSL endeavors to undertake the rehabilitation of 37.50 km of Feeder and Agricultural roads in various parts of the island with a view to significantly improve the quality of those roads. The major goal is to improve the safety and performance of these roads to keep user costs down. The development objectives to be achieved through the implementation of the project are:

- Promote and enhance social and economic development throughout the country.
- Improve significantly the general condition of Saint Lucia's road network.
- Afford greater comfort to motorists
- Guarantee through timely intervention the design life of roads
- Improve control and disposal of storm water
- Increase the longevity of existing roads
- Safeguard the investment made in road improvement

Effective planning is necessary if any project is to be delivered successfully. Hence during this project, the Project Manager will plan to develop the subsidiaries of the

Project Management Plan for the Government of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project-Phase II (FAARP II) to ensure that the project is executed within the triple constraints of Cost, Schedule and Quality.

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

A detailed Charter and Project Management Plan spelling out all the knowledge areas and processes necessary for the successful roll out of the Government of Saint Lucia's Feeder and Agricultural Roads Rehabilitation Project-Phase II (FAARP II) will be the key deliverable of this project. The plan will consist of all the subsidiary documents of a Project Management Plan.

General Objective-Final deliverable:
A detailed Project Management plan spelling out all the knowledge areas and processes necessary for the successful roll out of the Government of Saint Lucia's Feeder and Agricultural Roads Rehabilitation project –Phase II.
Specific objectives-Final deliverables:

Project Integration Management
1.A project Charter that will formally initiate the project and authorize the project manager to apply organizational resources to the project and to produce the Project Management Plan.

Project Scope Management
2.A Scope Management Plan that will ensure that the boundaries of the project are well defined from the outset and monitored rigorously.

Project Schedule Management
3.A Schedule Management Plan that will divide the project into tasks and create both a

schedule (start and finish dates for each task) and budget for each task so as to ensure that the project is completed within the time constraints.

Project Cost Management

4.A Cost management Plan that will define the processes for developing and managing the budget through rigorous estimating techniques and effective monitoring to ensure there are no unnecessary changes that make stakeholders unhappy and that the project is completed within budget.

Project Quality Management

5.AQuality Management Plan that will identify and detail all of the processes and activities needed for ensuring that all project activities necessary to design, plan and implement the project are effective and efficient with respect to the purpose of the objectives and its performance within the triple constraints of Time, Cost, and Quality.

Project Resource Management

6.A Resource Management Plan that will identify, acquire, manage and organize the finite resources needed to successfully complete the project within time, cost and scope.

Project Communications Management

7.A Communications Management Plan that will describe how the information needs of the project and its stakeholders are planned, monitored, structured and controlled to ensure timely and effective communication of the project status and other key information.

Project Risk Management

8.A Risk Management Plan that will help foresee risks, estimate impacts, identify actions to prevent them from occurring and reduce their impact should they eventuate.

Project Procurement Management

9.A Procurement Management Plan that will describe how items will be procured during the project and the approach that will be used to manage vendors on the project to deliver results.

Project Stakeholder Management

10.A Stakeholder Management Plan that will systematically identify, analyze, plan and implement actions designed to address, support, engage and manage all project stakeholders.

Assumptions
1.Reliable support in the form of adequate human resource will be made available by the University. 2.The project can be completed with three (3) months. 3.The requirements for the FGP as established by the University will remain the same. 4.Adverse weather will not disrupt electronic communications for extended periods of time. 5.The project can be completed successfully by one (1) person. 6.Failing health will not incapacitate the student.
Constraints
Time: Short time (three months) frame for undertaking the FGP Resource: Limited human resource. One person (Project Manager) available to undertake the project. Scope: Scope is quite large for the given time frame.
Preliminary risks

1.Failure to adhere to milestone dates may lead to delay and hence late delivery of project components.

2.Lack of timely support by supervisor or tutor can result in poor submissions or late delivery of project components.

Budget

US $250.00 as financial resources required to print, bind and ship Final Graduation Project to Costa Rica.

Milestones and dates

Milestone	Start Date	End date
FGP Start	05/13/19	05/13/19
Charter	05/13/19	05/17/19
WBS	05/13/19	05/17/19
Chapter 1.Introduction	05/20/19	05/24/19
Chapter 2.Theoretical Framework	05/27/19	05/31/19
Chapter 3.Methodological framework	06/03/19	06/07/19
Annexes -Bibliography and Schedule	05/20/19	06/07/19
Graduation seminar approval	06/10/19	06/14/19
Tutor Assignment	06/17/19	06/19/19
Adjustment of previous chapters	06/20/19	06/26/19
Chapter 4.Development (Results)	06/27/19	08/30/19
Chapter 5.Conclusion	09/02/19	09/06/19
Chapter 6.Recommendations	09/09/19	09/13/19
Tutor Approval	09/13/19	09/13/19
Reading by Reviewers	09/16/19	10/04/19
Reviewers work	09/23/19	10/04/19

	Adjustments	10/07/19	11/01/19
	Presentation to Board of Examiners	11/04/19	11/08/19

Relevant historical information

Feasibility studies have been carried out and reports prepared for the Tertiary Roads Development Program as an important part of GOSL's ongoing National Roads Development Program as follows:

•Tertiary Roads Development Program and Institutional Strengthening, Final Report and Annexes (3 Volumes), DIWI Consult International, GmbH, January 2002.
•Feeder and Agricultural Roads Phase 1, Feasibility Study DIWI Consult International, GmbH, December 2004.
•Agricultural and Economic Feeder Roads Program, Evaluation Report, Halcrow Group Ltd, January 2010.

For the rehabilitation of these 37.50 km of selected Feeder and Agricultural Roads the GOSL received financial assistance from the Kuwait Fund for Arab Economic Development (KFAED) for carrying out consulting services for the feasibility study and the preparation of engineering designs and tender documents. These were completed successfully in 2017.

Outstanding is Stage 2, execution of works.

The findings of all these studies constitute the background of the present study.
It is envisioned that FAARP Phases II will be implemented over a 2-year period, during the fiscal years 2020 to 2022.

Stakeholders

Direct stakeholders:

1.Global School of Project Management, University of International Cooperation, Costa Rica
2.Tutors and Course Lecturers
3.Board of Examiners
4.Project Manager (Albert Jn Baptiste)

Indirect stakeholders:

1.Reviewers
2.Department of Infrastructure, Ports, Energy and Labor of Saint Lucia (The student's employer)

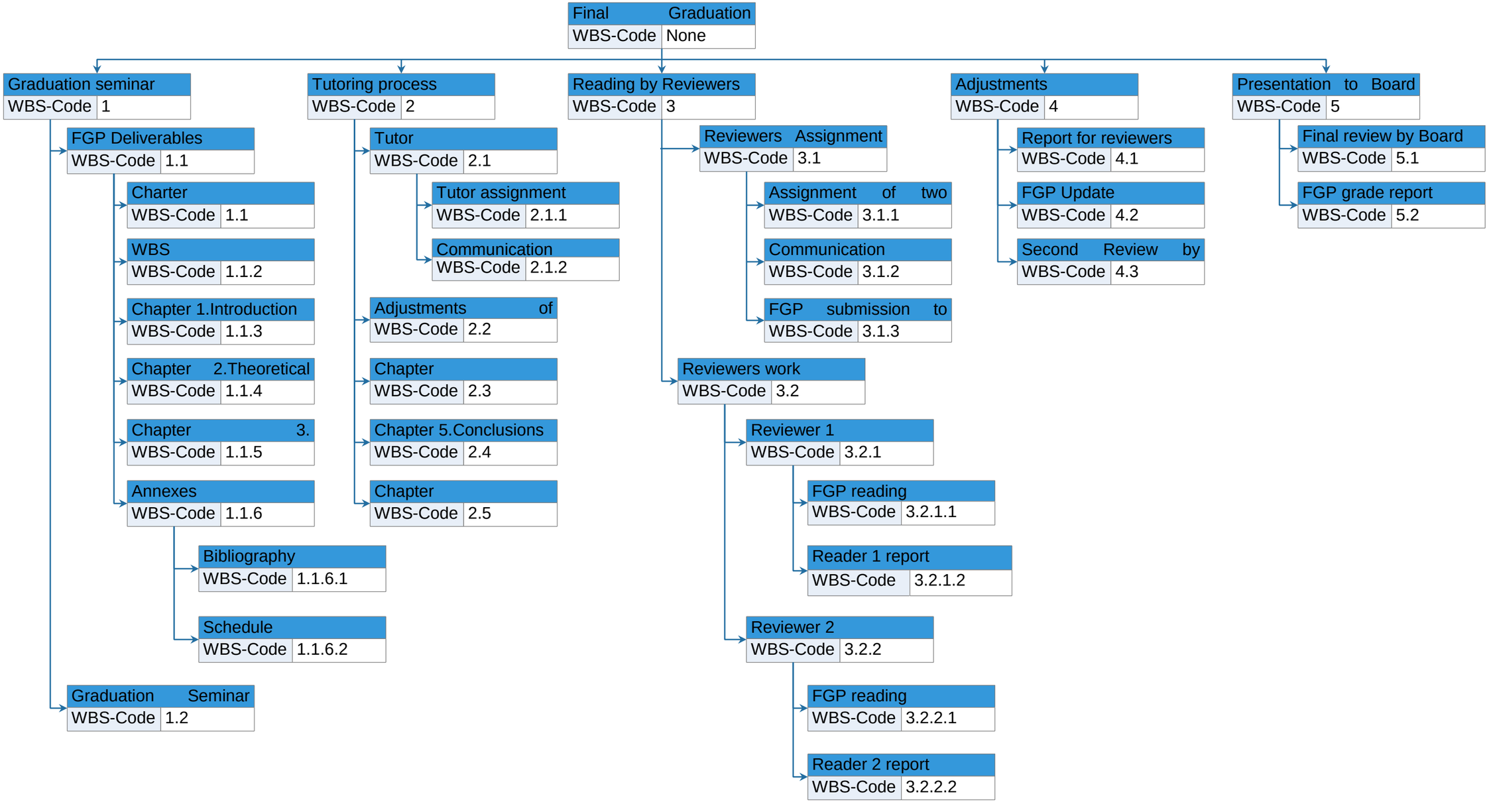
Project Manager: Mr. Albert Jn Baptiste	Signed:
Authorized by:	Signature:

Appendix 2: FGP WBS

ID	No	Task	Start	End
1		Final Graduation Project	05/13/19	11/08/19
2		FGP Start	05/13/19	05/13/19
3	1	Graduation Seminar	05/13/19	06/14/19
4	1.1	FGP Deliverables	05/13/19	06/07/19
5	1.1.1	Charter	05/13/19	05/17/19
6	1.1.2	WBS	05/13/19	05/17/19
7	1.1.3	Chapter 1.Introduction	05/20/19	05/24/19
8	1.1.4	Chapter 2.Theoretical Framework	05/27/19	05/31/19
9	1.1.5	Chapter 3.Methodological framework	06/03/19	06/07/19
10	1.1.6	Annexes	05/20/19	06/07/19
11	1.1.6.1	Bibliography	06/03/19	06/07/19
12	1.1.6.2	Schedule	05/20/19	05/24/19
13	1.2	Graduation seminar approval	06/10/19	06/14/19
14	2	Tutoring process	06/17/19	09/13/19
15	2.1	Tutor	06/17/19	06/19/19
16	2.1.1	Tutor assignment	06/17/19	06/17/19
17	2.1.2	Communication	06/18/19	06/19/19
18	2.2	Adjustment of previous chapters	06/20/19	06/26/19
19	2.3	Chapter 4. Development (Results)	06/27/19	08/30/19
20	2.4	Chapter 5. Conclusion	09/02/19	09/06/19
21	2.5	Chapter 6. Recommendations	09/09/19	09/13/19
22		Tutor Approval	09/13/19	09/13/19
23	3	Reading by Reviewers	09/16/19	10/04/19
24	3.1	Reviewers assignment request	09/16/19	09/20/19
25	3.1.1	Assignment of two reviewers	09/16/19	09/17/19
26	3.1.2	Communication	09/18/19	09/19/19
27	3.1.3	FGP submission to reviewers	09/20/19	09/20/19

28	3.2	Reviewers work	09/23/19	10/04/19
29	3.2.1	Reviewer	09/23/19	10/04/19
30	3.2.1.1	FGP reading	09/23/19	10/03/19
31	3.2.1.2	Reader 1 report	10/04/19	10/04/19
32	3.2.2	Reviewer	09/23/19	10/04/19
33	3.2.2.1	FGP reading	09/23/19	10/03/19
34	3.2.2.2	Reader 2 report	10/04/19	10/04/19
35	4	Adjustments	10/07/19	11/01/19
36	4.1	Report for reviewers	10/07/19	10/17/19
37	4.2	FGP update	10/18/19	10/18/19
38	4.3	Second review by reviewers	10/21/19	1101/19
39	5	Presentation to Board of Examiners	11/04/19	11/08/19
40	5.1	Final review by board	11/04/19	11/05/19
41	5.2	FGP grade report	11/06/19	11/08/19
42		FGP end	11/08/19	11/08/19

WBS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Graduation seminar
WBS-Code 1
FGP Deliverables
WBS-Code 1.1
Charter
WBS-Code 1.1
WBS
WBS-Code 1.1.2
Chapter 1.Introduction
WBS-Code 1.1.3
Chapter 2.Theoretical
WBS-Code 1.1.4
Chapter 3.
WBS-Code 1.1.5
Annexes
WBS-Code 1.1.6
Bibliography
WBS-Code 1.1.6.1
Schedule
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Graduation Seminar
WBS-Code 1.2
Tutoring process
WBS-Code 2
Tutor
WBS-Code 2.1
Tutor assignment
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Communication
WBS-Code 2.1.2
Adjustments of
WBS-Code 2.2
Chapter
WBS-Code 2.3
Chapter 5.Conclusions
WBS-Code 2.4
Chapter
WBS-Code 2.5
Reading by Reviewers
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Reviewers Assignment
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Assignment of two
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Communication
WBS-Code 3.1.2
FGP submission to
WBS-Code 3.1.3
Reviewers work
WBS-Code 3.2
Reviewer 1
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FGP reading
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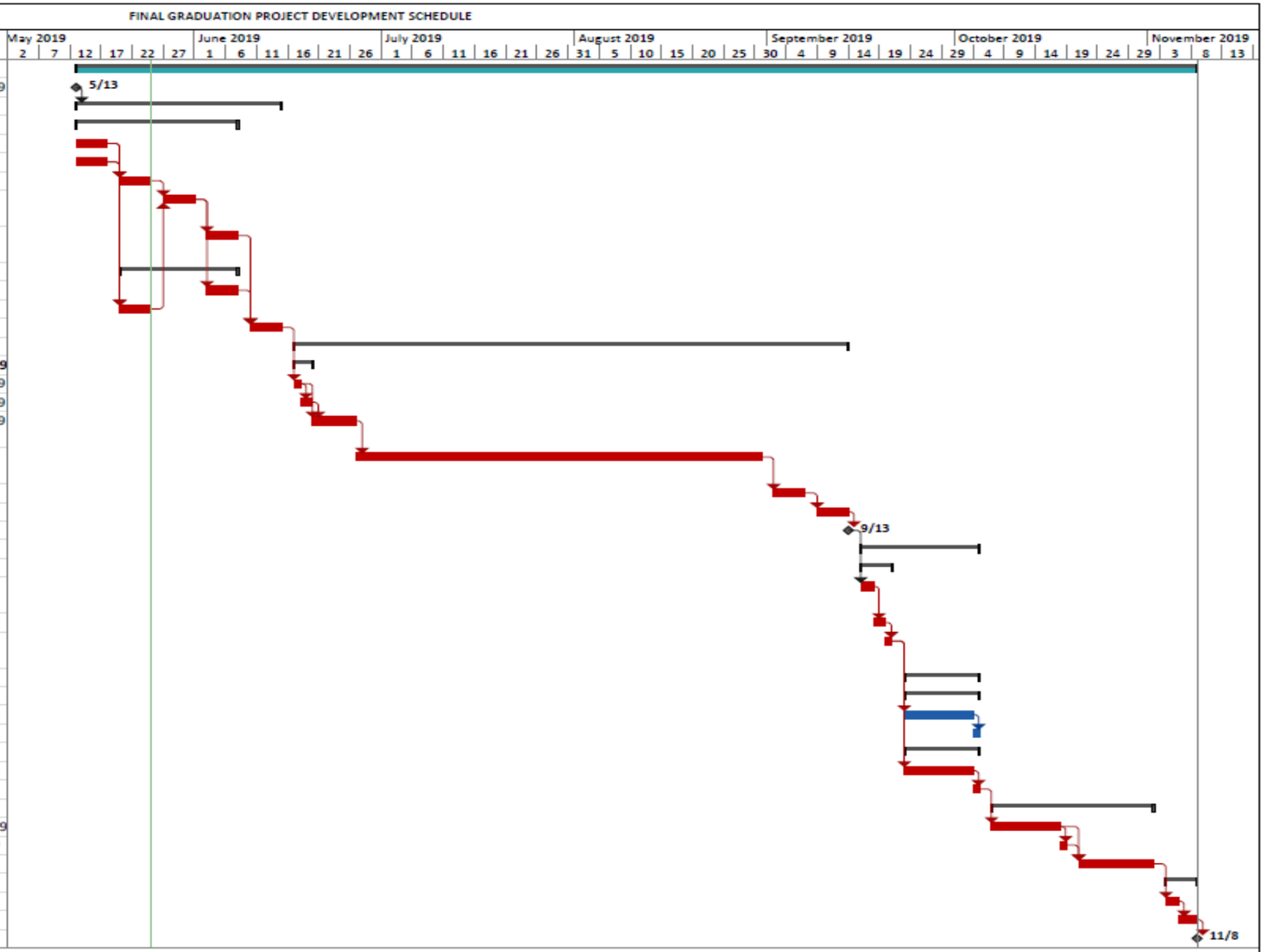
Reader 1 report
WBS-Code 3.2.1.2
Reviewer 2
WBS-Code 3.2.2
FGP reading
WBS-Code 3.2.2.1
Reader 2 report
WBS-Code 3.2.2.2
Adjustments
WBS-Code 4
Report for reviewers
WBS-Code 4.1
FGP Update
WBS-Code 4.2
Second Review by
WBS-Code 4.3
Presentation to Board
WBS-Code 5
Final review by Board
WBS-Code 5.1
FGP grade report
WBS-Code 5.2

Appendix 3: FGP Schedule

FINAL GRADUATION PROJECT DEVELOPMENT SCHEDULE

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Final Graduation Project**	**130 days**	**Mon 5/13/19**	**Fri 11/8/19**
2		FGP Start	0 days	Mon 5/13/19	Mon 5/13/19
3		**1,Graduation Seminar**	**25 days**	**Mon 5/13/19**	**Fri 6/14/19**
4		**1.1,FGP Deliverables**	**20 days**	**Mon 5/13/19**	**Fri 6/7/19**
5		1.1.1,Charter	5 days	Mon 5/13/19	Fri 5/17/19
6		1.1.2,WBS	5 days	Mon 5/13/19	Fri 5/17/19
7		1.1.3,Chapter I. Introduction	5 days	Mon 5/20/19	Fri 5/24/19
8		1.1.4,Chapter II. Theoretical framework	5 days	Mon 5/27/19	Fri 5/31/19
9		1.1.5,Chapter III. Methodological framework	5 days	Mon 6/3/19	Fri 6/7/19
10		**1.1.6,Annexes**	**15 days**	**Mon 5/20/19**	**Fri 6/7/19**
11		1.1.6.1,Bibliography	5 days	Mon 6/3/19	Fri 6/7/19
12		1.1.6.2,Schedule	5 days	Mon 5/20/19	Fri 5/24/19
13		1.2,Graduation Seminar approval	5 days	Mon 6/10/19	Fri 6/14/19
14		**2,Tutoring process**	**65 days**	**Mon 6/17/19**	**Fri 9/13/19**
15		**2.1,Tutor**	**3 days**	**Mon 6/17/19**	**Wed 6/19/19**
16		2.1.1,Tutor assigment	1 day	Mon 6/17/19	Mon 6/17/19
17		2.1.2,Communication	2 days	Tue 6/18/19	Wed 6/19/19
18		2.2,Adjustments of previous chapters (If needed)	5 days	Thu 6/20/19	Wed 6/26/19
19		2.3,Chapter IV. Development (Results)	47 days	Thu 6/27/19	Fri 8/30/19
20		2.4,Chapter V. Conclusions	5 days	Mon 9/2/19	Fri 9/6/19
21		2.5,Chapter VI. Recommendation	5 days	Mon 9/9/19	Fri 9/13/19
22		Tutor approval	0 days	Fri 9/13/19	Fri 9/13/19
23		**3,Reading by reviewers**	**15 days**	**Mon 9/16/19**	**Fri 10/4/19**
24		**3.1,Reviewers assigment request**	**5 days**	**Mon 9/16/19**	**Fri 9/20/19**
25		3.1.1,Assigment of two reviewers	2 days	Mon 9/16/19	Tue 9/17/19
26		3.1.2,Communication	2 days	Wed 9/18/19	Thu 9/19/19
27		3.1.3,FGP submission to reviewers	1 day	Fri 9/20/19	Fri 9/20/19
28		**3.2,Reviewers work**	**10 days**	**Mon 9/23/19**	**Fri 10/4/19**
29		**3.2.1,Reviewer**	**10 days**	**Mon 9/23/19**	**Fri 10/4/19**
30		3.2.1.1,FGP reading	9 days	Mon 9/23/19	Thu 10/3/19
31		3.2.1.2,Reader 1 report	1 day	Fri 10/4/19	Fri 10/4/19
32		**3.2.2,Reviewer**	**10 days**	**Mon 9/23/19**	**Fri 10/4/19**
33		3.2.2.1,FGP reading	9 days	Mon 9/23/19	Thu 10/3/19
34		3.2.2.2,Reader 2 report	1 day	Fri 10/4/19	Fri 10/4/19
35		**4,Adjustments**	**20 days**	**Mon 10/7/19**	**Fri 11/1/19**
36		4.1,Report for reviewers	9 days	Mon 10/7/19	Thu 10/17/19
37		4.2,FGP update	1 day	Fri 10/18/19	Fri 10/18/19
38		4.3,Second review by reviewers	10 days	Mon 10/21/1	Fri 11/1/19
39		**5,Presentation to Board of Examine**	**5 days**	**Mon 11/4/19**	**Fri 11/8/19**
40		5.1,Final review by board	2 days	Mon 11/4/19	Tue 11/5/19
41		5.2,FGP grade report	3 days	Wed 11/6/19	Fri 11/8/19
42		FGP End	0 days	Fri 11/8/19	Fri 11/8/19



Project: Jn Baptiste,Albert FGP Sc
Date: Sat 5/25/19

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

Appendix 4: Philologist's Remarks and Qualifications.

Angela Marie Paul Jean Baptiste
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Castries, St. Lucia
ajnbaptiste@sjc.edu.lc; (758)584-6047/450-2789

October 6, 2019

Academic Advisor

Master's Degree in Project Management (MPM)

Universidad para la Cooperacion Internacional (UCI)

Dear Academic Advisor,

Re: Philological Review of Final Graduation Project submitted by Mr Albert Jn. Baptiste in partial fulfilment of the requirements for the Masters in Project Management (MPM) Degree.

I hereby confirm that **Mr Albert Jn. Baptiste** has made all the corrections to the Final Graduation Project document as have advised. In my opinion the document does now meet the literary and linguistic standards expected of a student reading for a degree at the Masters Level.

I am a trained English Language teacher who have been instructing students at the high school level since 2011. I have a Bachelor's Degree in Education from the *University of the West Indies*, *Cave Hill Campus*, Barbados. A copy of the same is attached.

Angela Jean Baptiste, B.Ed.

THE UNIVERSITY OF THE WEST INDIES

Angela Marie P. Jean-Baptiste

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

BACHELOR OF EDUCATION

EDUCATION

(TEACHING OF LANGUAGE ARTS)

with

Second Class Honours (Upper Division)

CERTIFIED A TRUE COPY
Sign:
REGISTRAR OF EXAMINATIONS
14 NOV 2011
Ministry of Education and Culture (Saint Lucia)

July 1, 2011

DATE

VICE-CHANCELLOR

UNIVERSITY REGISTRAR