UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

FINAL GRADUATION PROJECT

THE PROJECT MANAGEMENT PLAN FOR THE ASSET MANAGEMENT PLATFORM PROJECT

Satish Mohan

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MARÍA FERNANDA IBARRA

_____

TUTOR

CARLOS CASTRO

_____

REVIEWER No.1

LUIS DIEGO ARGUELLO

_____

REVIEWER No.2

SATISH VINOD MOHAN

_____

STUDENT

DEDICATION

I dedicate this work to my wife who has supported me during the past months, which had enabled me to spend more time on this Master's program.

Finally, I would like to dedicate this work to my two children, Nira and Uday, and hope they also will follow the path of higher education.

Thank you.

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ABSTRACT

The Ministry of Public Works of the Republic of Suriname executes a lot of projects with funding from various sources. There is no specific method to prepare the project and no formal guidance to do so. Pluvial flooding is the most predominant natural disaster in many areas of Suriname, including the capital city of Paramaribo. Information about flooding events is also not readily available to the general public.

The ministry is launching a project to create an Asset Management Platform that provides the population of Paramaribo and surrounding areas, in the case of rain events and provides the correct information on potential flooding.

The Asset Management Platform is a project suited to integrate all knowledge areas the Project Management Institute identifies. The PMBOK Guide is the tool to create an acknowledged Project Management Plan for this project and is the key to successful project implementation. Creating a communication, stakeholder management plan will assist the project team in keeping stakeholders interested, informed, and satisfied during the project life cycle.

The schedule, scope, resource, and cost management plan defines the what, who and when of the deliverables whilst integrating the costs of the project. The procurement management plan describes the matter to attain resources, goods, and services for the project. The risk and quality management plan ensure the project team has the tools to meet the deliverable meets the requirements and how it deals with risks associated with the project. This project management plan serves as a template for future projects.

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ABBREVIATIONS AND ACRONYMS

AMP	Asset Management Platform
DTM	Digital Terrain Model
EV	Earned Value
FGP	Final Graduation Project
hydro-met	Hydrological and Meteorological
IPF	Investment Project Financing
MFP	The Ministry of Finance & Planning, Suriname
MPW	The Ministry of Public Works, Suriname
NO WB	No Objection from the World Bank Group
PAD	Project Appraisal Document
PMBOK	Project Management Body of Knowledge
PMI	The Project Management Institute
PMP	Project Management Plan
PS-Fin	Permanent Secretary of the Ministry of Finance and Planning
PS-MPW	Permanent Secretary of the Ministry of Public Works
QCBS	Quality and Cost Based Selection
RACI	Responsible, Accountable, Consulted and Informed
RAM	Responsibility Assignment Matrix
RBS	Risk Breakdown Structure
RFB	Request For Bids
RFP	Request For Proposals
SCSRP	Saramacca Canal System Rehabilitation Project
SCU	Saramacca Canal Unit
STEP	Systematic Tracking of Exchanges in Procurement
TAS	Telecommunication Authority Suriname
USD	United States of America Dollar
WB	The World Bank Group
WBS	Work Breakdown Structure
symbol >	greater\ larger than
symbol <	less\ smaller than

EXECUTIVE SUMMARY

The country of Suriname is located on the continent of South America and has a population of nearly 591.000. The Capital city, Paramaribo, is prone to pluvial flooding, which has been the predominant natural disaster in recent decennia. Although meteorological and hydrological data is being recorded at several stations in the capital, this data does not reach the public and they cannot prepare themselves in the event of flooding. To mitigate this the Ministry of Public Works, who is also responsible for the management of stormwater, wants to create an online platform for the citizens to better inform them ahead of any potential flooding events.

Because this project will have a great effect on the well-being of the population it is necessary to approach this project appropriately. Normally projects, executed through the Ministry of Public Works do not have a predefined process and most are done as a standalone or ad-hoc project, this approach will not be suitable for such an important project. The goal of the project is to create an Asset Management Platform, which will integrate rainfall data, hydrological flow meters data, information from sluices and pumping stations, and the digital terrain model to create flood maps and predict flood depths, which will enable the population to make the necessary preparations.

The general objective of the Final Graduation Project was to develop a Project Management Plan for the creation of the Asset Management Platform project, wherein the knowledge obtained during this master's program in project management was applied to the project. The objective was to apply the ten knowledge areas on the project to define the scope, schedule, resources, stakeholder, cost, communication, procurement, risk, and quality management plans. The lessons learned from the development of the PMP for this project could serve as a template for other projects being executed through the Ministry of Public Works.

The Methodology used for the development of the PMP was to interview the key stakeholders and define the deliverables and the other stakeholders were asked to participate in a survey to further define the scope and expected results from the project. The tools and techniques from the PMBOK guide 6th Edition were used to analyze the data and were processed in the development of the specific management plans, such as scope, risk, quality, schedule, and so on. Furthermore, a cost management plan was created to calculate the budget of the project which utilized the inputs from the procurement plan. Because this project had required the full support of the stakeholders the stakeholder management plan was created to analyze the way to approach each stakeholder. By creating the communication management plan the project team would be able to manage the communication lines and methods more effectively.

The AMP project has 6 deliverables, which are the contract with the Consulting Firm, the works contract with a Contractor, the Base AMP model, the conversion of historical Hydrology and Meteorological (hydro-met) data, the installation of new hydro-met stations, and the online version of the AMP.

To successfully implement the project the SCU must start the project on November 1st, 2021 to complete the works by April 1st, 2024. This is within the allowed WB loan agreement timeframe. The project has identified 21 types of risks that should be managed by the project team. The successful hiring of the consulting firm and the works to be completed for the installation of the new hydro-met stations, within the allowed period as per the schedule are the most critical activities of this project and failure to do so could result in the cancelation of the project.

It is advised that the MPW should start negotiations with the Ministry of Finance & Planning and the World Bank on a potential extension of the loan agreement, which could mitigate some risks of this project.

INTRODUCTION

1.1. Background

The Country of Suriname is located on the north middle side of the continent of South America and bordered by Guyana in the west, Brazil in the south, French Guyana in the east and, the Atlantic Ocean in the north. The capital is the city of Paramaribo, which also inhabits nearly 223.700 persons of the total population of 591.254.

In Suriname, the primary natural disaster identified is flooding due to excessive rainfall. In the capital, Paramaribo this urban flooding leads to road deterioration, property flooding, and health risks. The Ministry of Public Works is responsible for water management and its infrastructure in Paramaribo.

Between 2015 and 2017, a Flood Risk Assessment study was carried out with financial and technical support from the World Bank. This study identified the main infrastructural activities needed to minimize the risk of flooding as well as the soft measures needed.

In July 2019, the Government of Suriname signed a loan agreement with the World Bank for the rehabilitation of the Saramacca Canal System. The Ministry of Public Works is the executing agency for this loan. The loan amount is USD 35 million. This project is a very important stormwater management project and needs to be delivered by December 31, 2024. To manage the execution of the project, a project management team named Saramacca Canal Unit (SCU) was established. This SCU will be responsible for the hiring of firms and contractors, administrative, financial, and reporting tasks, stakeholder management on behalf of the Ministry of Public Works. As per requirement, the SCU should be composed of employees of the

Ministry of Public Works and specific specialists to be hired through procurement procedures.

The Saramacca canal is located nearly 4 km south of the city center of Paramaribo. Paramaribo is the Capital city of the Republic of Suriname, South America. The canal has multiple functions, such as stormwater drainage, irrigation, and water transport. The predominant function till now has been drainage. The last major improvement on the canal was done in the late 1950s.

The Saramacca canal directly affects the water management of nearly 300.000 inhabitants of Suriname. The effect of climate change, with sea temperatures set to rise in the future, the local storms and associated rainfall events are likely to become more intense.

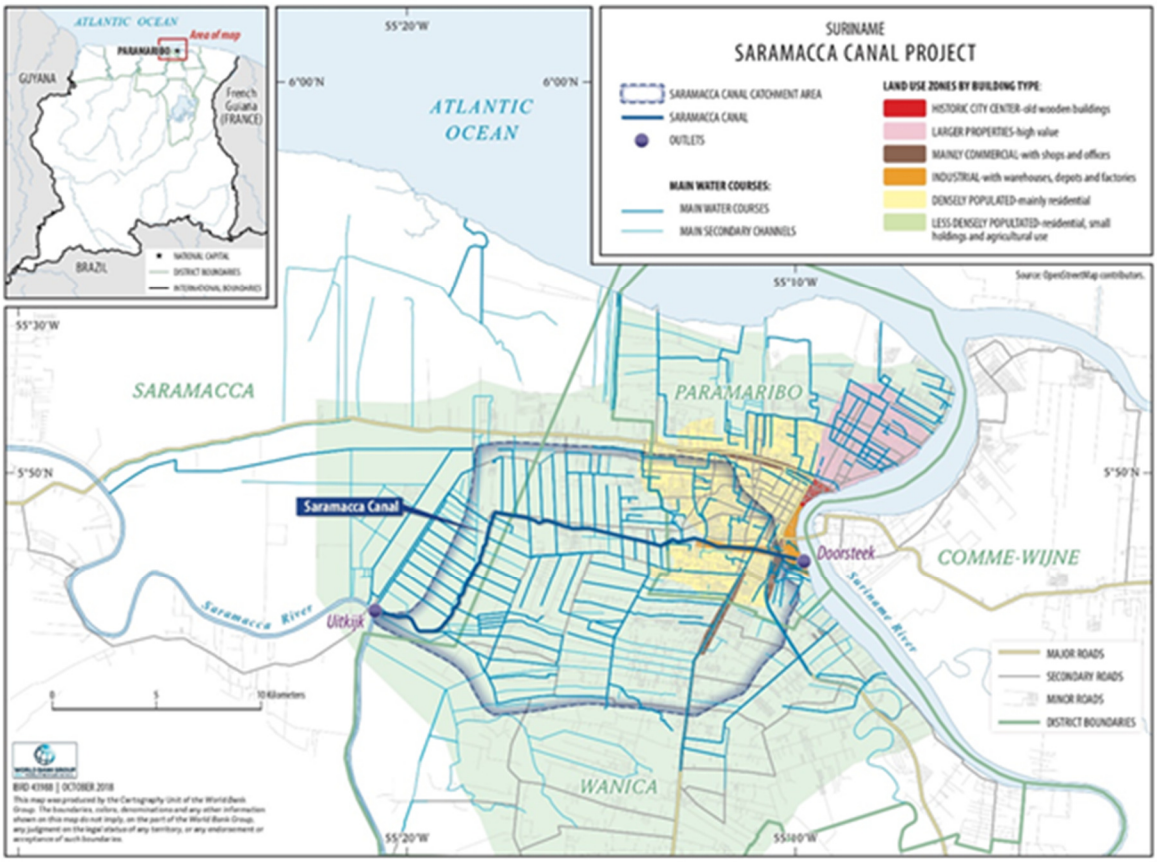

Figure 1 **Map of location Saramacca canal (World Bank, 2018, p.41)**

The canal drains nearly 60% of the urban area of Paramaribo, and the area affected by the functioning of the canal is estimated at 190 km2. Along the canal, there are timber and other granulate material producers located, who use the canal to transport bulk cargo from the logging and mining areas through the canal to their facilities or the Port of Paramaribo for export.

The outcome of this project is to improve the flow and retention capacity of the canal during pluvial flooding events. The reconstruction of the navigational locks and re-profiling of the canal will also improve ship traffic and allow access to the canal around the clock (24/7 operations). To better prepare the public for future flooding events an Asset Management Platform (AMP) will be created.

The proper access to data for consultants and the public on flooding is missing. Furthermore, the data is scattered and it needs to be managed more effectively into products the public can easily understand. Combining collected rainfall data, with flow meter and tidal data with a Digital Terrain Model (DTM) can lead to producing flood maps. With flood maps, the population can better prepare for flooding in the rainy periods.

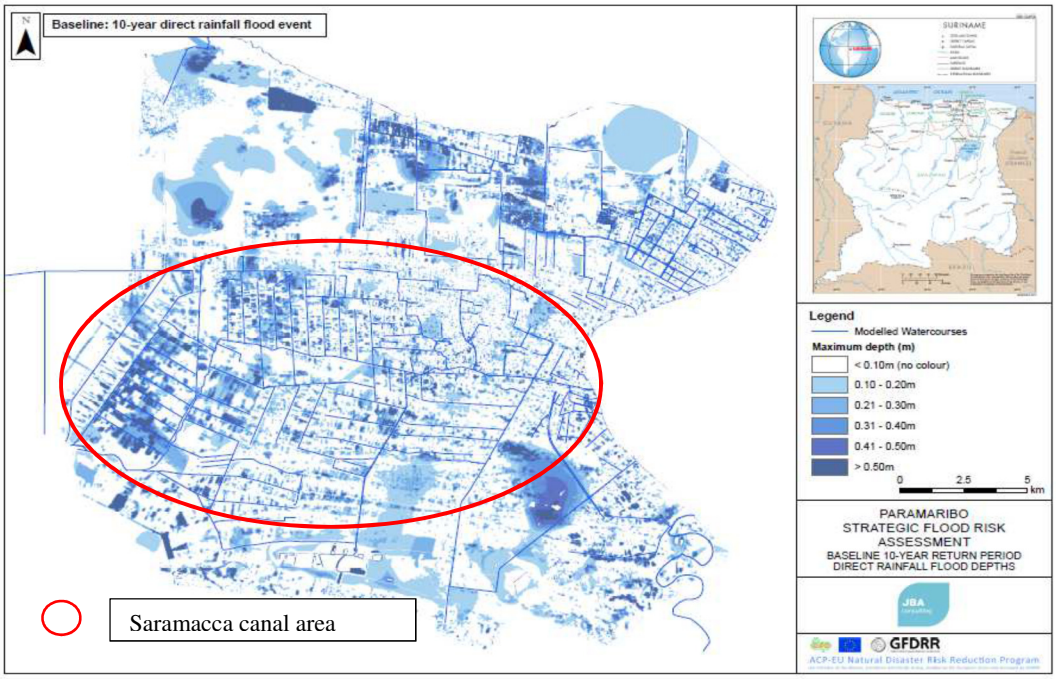

Figure 2 Flood map 10-year flooding event (Guzman, 2017, p. 47)

An Asset Management Platform (AMP) should be created, which will combine all collected data and produce interactive maps, which will be available to the public. Scholars and students will be allowed a higher level of access after request.

1.2. Statement of the problem

For most projects executed by the MPW the project management processes and knowledge, areas are not fully applied. Project management plans from the MPW do not include all necessary documentation to fully adhere to Project Management Institutes guidelines for the project. The Project Managers of the MPW do have enough experience in creating these documents and yet many do not have quick access to training to learn how to create a PMP. The AMP is an actual project which will be executed, so applying the PMI theories to this project will help other project managers to learn how to apply the PMBOK guidelines on local projects.

1.3. Purpose

This FGP will focus on creating a Project Management Plan (PMP) for the project to create an AMP to help the SCU initiate the project using and applying the knowledge learned in the Master program for Project Management from the University for International Cooperation (UCI). The processes for this FGP will be limited to the initiation and planning of the project.

Not having many local PMP's, which fully follow the PMBOK guidelines, makes it difficult for project managers to gain the right experience in project management. This PMP will help create a proper template for other projects and sharing this document will help other project managers learn from the results of the FGP.

1.4. General objective

The FGP objective is to develop a project management plan for the project of creating an Asset Management Platform for the Saramacca Canal System, to enable efficient usage of the drainage system.

1.5. Specific objectives

The FGP will have the specific objectives of the projects are:

1. To develop the Project Charter for the project, to define the project objectives.
2. To develop a Scope Management Plan, which defines the work needed to be done to achieve the deliverables of the project.
3. To develop a Schedule Management Plan, which determines the project duration.
4. To develop a Stakeholder Management Plan, to help the project team identify and manage stakeholder engagement.
5. To develop a Resource Management Plan for the AMP, which will access which resources are available internally or externally to execute the project.
6. To develop the Procurement Management Plan for the scope of the project, which will describe the method and processes needed to access and contract external resources and supplies.
7. To develop the Quality Management Plan, which will set the quality parameters and the procedures to control the quality of the project.
8. To develop a communication management plan for the stakeholders, which will define the strategy for internal en external communication
9. To develop a Risk Management Plan for the project, which will identify procedures to enable the team to manage the risk for the project.
10. To develop a cost estimate for the project, to calculate the cost of the project and procedure to evaluate the earned value of the project.

THEORETICAL FRAMEWORK

2.1 Company/Enterprise framework

2.1.1 Company/Enterprise background

The Ministry of Public Works (MPW) of the Republic of Suriname is responsible for all primary infrastructure in Suriname, which includes roads, bridges, levies, waterways, drainage canals, sluices, and pumping stations. For the capital district of Paramaribo, the mandate also includes secondary and tertiary infrastructure.

Furthermore, the MPW is also responsible for:

- Formulating and implementing policy, arranging for the planning and development of construction and civil engineering works and facilities for the public benefit;
- Collecting hydrological data and management thereof
- Collecting meteorological data and management thereof, including services for aviation
- Making Spatial- and plot development plans
- Building works
- Collecting and managing waste (domestic)
- Urban drainage water management and flood prevention
- Coastal protection and river embankments

2.1.2 Mission and vision statements

The Mission Statement of the MPW is:
The Ministry of Public Works develops, builds, and maintains public goods for a livable, clean, and beautiful Suriname. (Gov.sr, 2019)

The Vision statement:
The most friendly and professional public organization, through effective use of state resources, developing sustainable public good and manages, for the quality of life in Suriname. (Gov.sr, 2019)

The project to create an AMP helps improve the quality of life because; it will inform the public on flooding events and provide information on what is done to mitigate flooding.

2.1.3 Organizational structure

The MPW has three directorates, namely Building Works and Services, Public Green and, the Directorate of Civil Engineering Works. Of the Directorate of Civil Engineering works, the Sub-Directorate of Water-related Civil Engineering Works will execute the project to create the AMP. This Sub Directorate includes the divisions of Embankments, Drainage, Hydrology, and Meteorology.

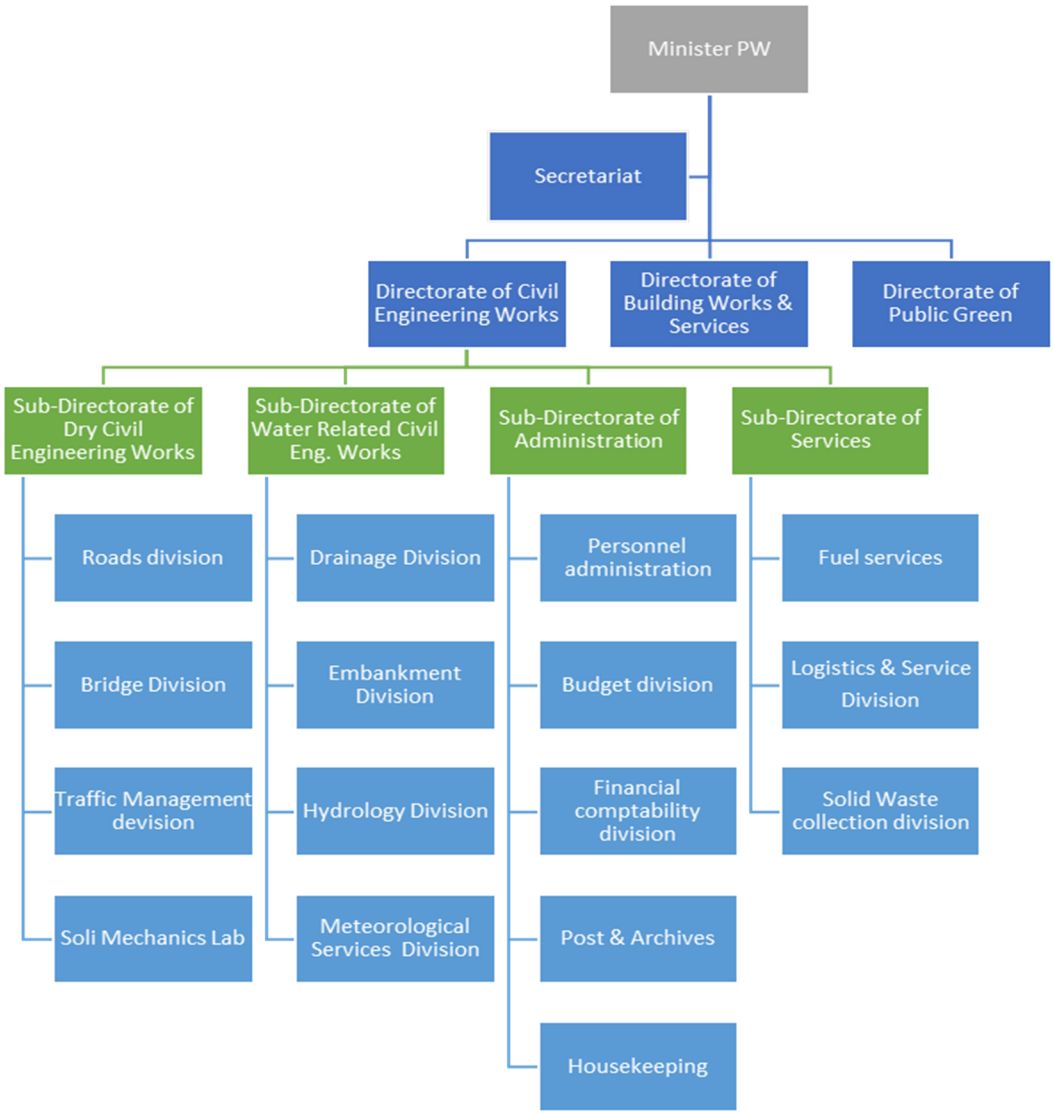

Figure 3 **Organizational Chart Ministry of Public Works (source: http://publicworks.gov.sr/over-ministerie/organisatie-structuur/)**

Each Directorate is responsible for their part of the responsibilities. The Directorate of Civil Engineering Works is responsible for the development of new infrastructural works as well as the maintenance and management of the existing works. These includes roads, bridges, canals, sluices and pumping stations, traffic signals, and markings.

Furthermore, the directorate is responsible for the meteorological and hydrology services, equipment, and network.

Each technical division, for example, the Drainage Division, is responsible for implementing their specific projects, such as improving flow capacities in different areas, building new or rehabilitating sluices and pumping stations, maintenance projects, dredging works, etc.
Projects are initiated from various sources, and a project manager is assigned throughout the project life cycle. Personnel from within the Ministry assist the project manager. Once the scope is defined and agreed upon by the head of the division and the key stakeholders, the project is submitted via the Deputy Director to the Director for approval to continue with the following steps, such as procurement, execution, and closing. For projects executed with our local regulations, there is mostly no need for extensive environmental and social impact analysis. In addition, no risk analysis is required and, the Project Management Institute (PMI) approach for projects is not used entirely.

When projects are to be executed through loans, grants, or other entities not related to the local government, the project life cycle as recommended by the PMBOK guide is adhered to. In addition, the project management will mostly be done by a project management unit, which is formed by government officials and individual consultants. This will be the case for the project to create the AMP as well since it is funded with a loan from the World Bank.

2.1.4 Products offered

The MPW is responsible for the building or rehabilitation and maintenance of infrastructure and as such, the products are mostly the building of new, rehabilitating,

and or improvements on roads, bridges, culverts, sluices and pumping stations, governmental buildings, parks, and general public areas.

Other products are permits for various services such as plot (land) development, building houses, and commercial buildings, parking spaces, and entrances to plots.

The MPW also provides information on request such as rainfall, tides, water quality, soil tests, and soil mechanics.

Through improvements on the Government's official website more services are and will be offered to the public, such as weather information, permit status, procurement notices and publications and, complaints.

The FGP will expand on the information the MPW provides, to make it more accessible to the public. With the AMP, you will get an integrated data, which is more relatable to the end-user. The integrated data will allow the user to see the impact is of rainfall in their neighborhood.

2.2 Project Management concepts

2.2.1 Project

The Project Management Body of Knowledge (PMBOK® Guide) defines a project as "a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2017). Projects should adhere to these two main parts, namely temporary, and uniqueness.

Temporary refers to the clear definition as to having a start and end date, which is expressed in the project documents.

Uniqueness refers to being only one of its kind, and not part of the routine operation. The project documents should explicitly describe what is required to be accomplished with the project.

At the MPW the definition of a project is not defined clearly, as some operations are actual projects, but are not defined as such. Some daily activities are projects themselves but are incorporated in the operations. Examples of these especially related to the Drainage Division are, repairing a broken-down pump or sluice door or the ad-hoc cleaning clogged sewerage pipe. These should be executed as projects as they require planning, resources and costs and are temporary endeavors resulting in a unique result.

The creation of an Asset Management Platform should tick both parts of the definition as the project should be executed within the timeframe of the loan and it will create something unique for the city of Paramaribo. Through stakeholder involvement, a clear definition of the expected results will be defined.

2.2.2 Project management

Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project Management is accomplished through the appropriate application and integration of the project management processes identified for the project (PMI, 2017, p. 48).

For complex projects, project management should be assigned to a dedicated team of experts. For each type of project, the Project Manager (PM) is the most critical role of the team. The influence of the PM is internal and external to the organization.

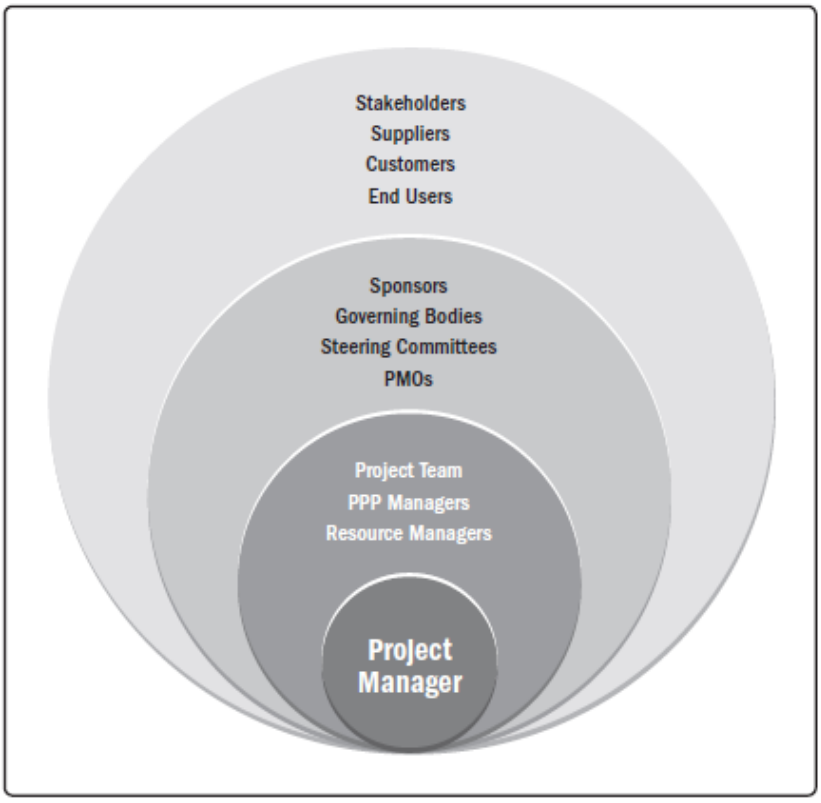

Figure 4 **The Project Managers Sphere of influence (Source: PMBOK Guide 6th Edition, by PMI.org, 2017, Part 1, p 53)**

2.2.3 Project life cycle

A project life cycle is the sequence of phases, which a project has to go through from start to end. The PMBOK Guide defines 4 phases, starting the project, organizing and preparing, carrying out the work, and ending the project.

Each phase has a milestone, called a phase gate, which when reached opens the following phase of the project. The figure on the next page graphically depicts the phases and concerns the Project Management processes as defined by the PMBOK Guide 6th edition.

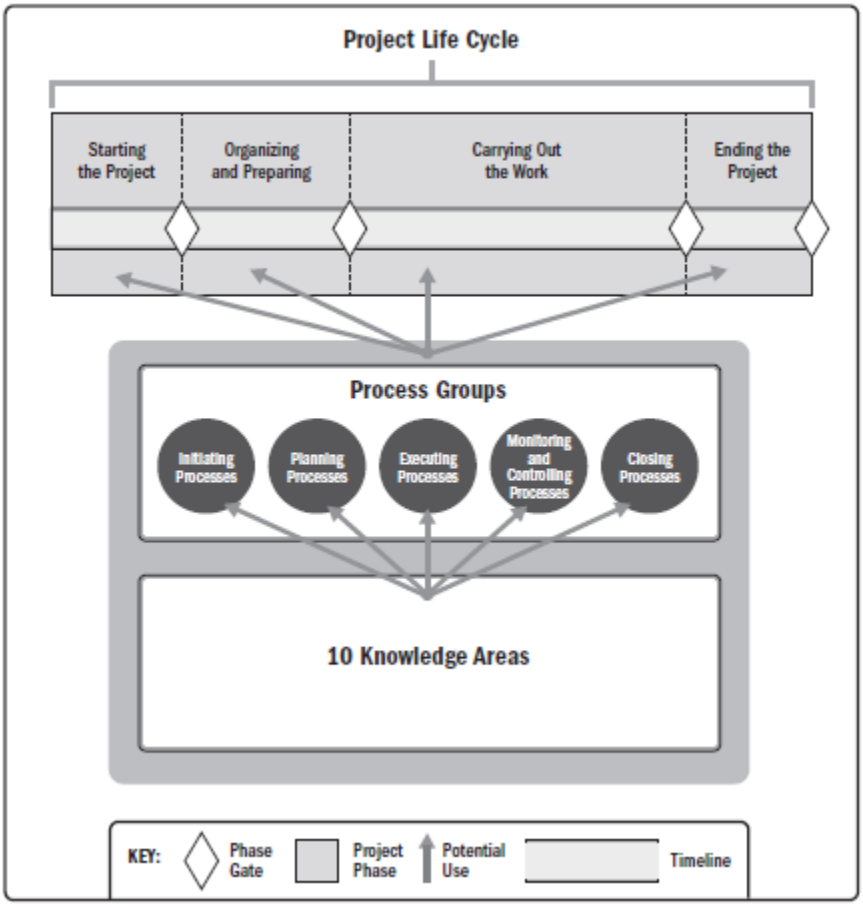

Figure 5 **Interrelationship of PMBOK Guide key components in Projects (Source PMBOK Guide 6th Edition, by PMI.org, 2017, Part 1, p. 18)**

2.2.4 Project management processes

The PMBOK Guide, 2017, defines five process groups, which throughout the project life cycle manage a project. These process groups are:

1. Initiating process group
2. Planning process group
3. Executing process group
4. Monitoring and controlling process group
5. Closing process group.

Each project will have to go through all these processes during the project life cycle. Process groups are not identical to the previously defined project phases, the processes flow interactively between the phases. The five groups contain 49 processes, which are spread over the 10 knowledge areas, which are shown in table 1: Project Management Process Group and Knowledge Area Mapping.

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

Figure 6 **Project Management Process Groups and Knowledge Area Mapping (Source: PMBOK Guide 6th Edition, 2017, by PMI.org, Part 2. P. 556)**

2.2.5 Project management knowledge areas

The Knowledge Areas are, described in PMBOK Guide, 6th Edition, as the fields or areas of specialization that are commonly employed when managing projects. (PMI.org, 2017, Part 2 p. 553)

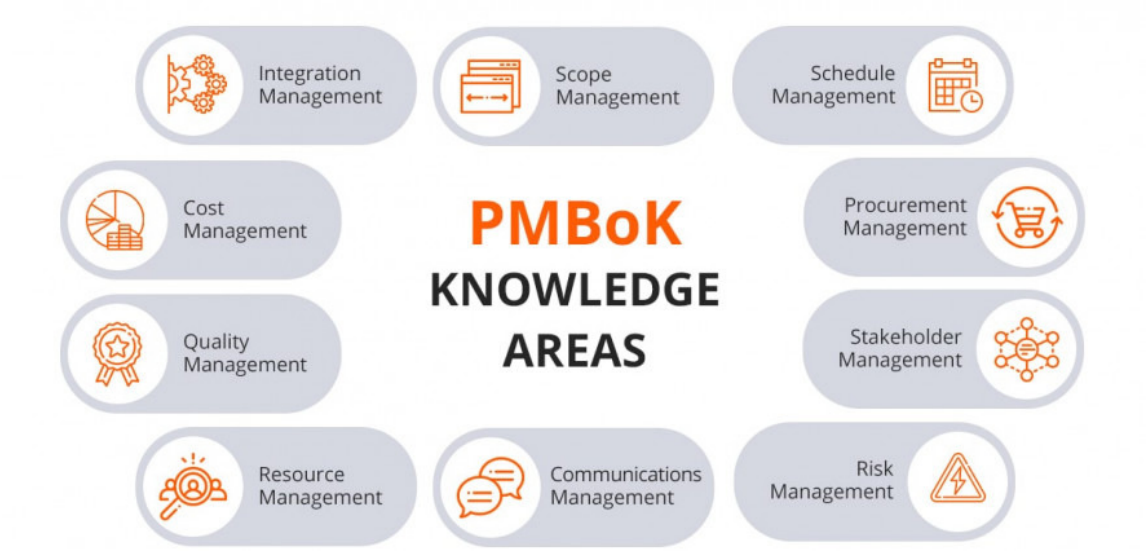

Figure 7 PMBOK Knowledge Ateras (Source Harvin, H. Education, 2021, https://www.henryharvin.com/blog/project-management-area-of-knowledge/)

The Project Management Institute (PMI) has identified 10 knowledge areas:

Chart 1 Overview of the Knowledge Areas (source PMBOK Guide, 2017)

No	Knowledge Area	Purpose
1	Project Integration Management	To properly define the Project, the expected results and benefits, and identify the constraints and assumptions.
2	Project Scope Management	The proper definition of the Works, activities, and processes which should be done to achieve the results of the Project
3	Project Schedule Management	Development of a timetable, which will guide the project from start to end, which

No	Knowledge Area	Purpose
		includes a tool to adjust and monitor the progress
4	Project Cost Management	To properly identify the different costs in detail, and try to create a method to monitor progress.
5	Project Quality Management	Defines the quality requirements for each result and the method to achieve said quality.
6	Project Resource Management	Is the assessment of who and what is needed to properly do the project.
7	Project Communications Management	To establish how, with whom, and what the frequency, the method should be used to properly communicate within the project team as well as outside of the team.
8	Project Risk Management	An analysis of the general and specific risks associated with the project and its environment and how to deal with these risks.
9	Project Procurement Management	The assessment of the needs (services, goods, works) of the project and how to access them properly using the defined methods.
10	Project Stakeholder Management	Defining who the stakeholders are, and assessing and reassessing their role, involvement, power on the project. This also includes a tool to manage stakeholder engagements.

2.2.6 Applications of Project management knowledge areas

Integration Plan

Project Integration Plan includes the processes and activities to identify, define and coordinate the various processes and project management activities. (PMI, 2017). This part includes the Project Charter & the Integrated Change Control

The Charter will be developed in chapter 4.1.1.
A project charter is a formal, typically short document that describes your project in its entirety — including what the objectives are, how it will be carried out, and who the stakeholders are. It is a crucial ingredient in planning the project because it is used throughout the project life cycle. (www.wrike.com, 2016)

Developing a Project Charter helps the project team word the needs and requirements of the project sponsor. The charter contains the information needed to start a project and a reference document to make sure the key stakeholders are in agreement.

Integrated Change Control, developed in chapter 4.1.2., is the process of reviewing all change requests; approving changes and managing changes to deliverables, project documents, and the project management plan; and communicating the decisions. (PMI, 2017)

Scope Management

The Project Management Institute (PMI) Project Management Book of Knowledge (PMBOK) defines the Work Breakdown Structure (WBS) as a “deliverable oriented hierarchical decomposition of the work to be executed by the project team.”
The WBS is developed in chapter 4.2.2.

Schedule Management Plan

The PMBOK Guide defines activities as the process of identifying and documenting the specific actions to be performed to produce the project deliverables. (PMI, 2017) The activities will be listed in the register, which is part of chapter 4.3.

Cost Management Plan

The project requires cost calculations for consulting services, supplies and works, which are developed in chapter 4.5.

For the costs of consulting services, the calculations are based on:

- Historical data from other projects.
- Estimating the amount of time needed to complete each activity, which is derived from the Schedule.
- Estimating the number of persons needed to complete an activity.
- Estimating the % of the time each person should be available to complete an activity.
- Estimating the amount spend on logistical costs per activity.
- Estimating the costs of the overhead per activity.

For costs of works and supplies, the costs are based on:

- Historical data from other projects.
- Estimating the number of supplies, materials needed.
- Estimating the unit price of the activity.
- The unit price includes all other costs such as labor, machine hours, and transport.

METHODOLOGICAL FRAMEWORK

3.1 Information sources

3.1.1 Primary sources

Primary Sources are immediate, first-hand accounts of a topic, from people who had a direct connection with it. Primary sources can include: (Healy Library, 2021)

- Texts of laws and other original documents.
- Newspaper reports, by reporters who witnessed an event or who quote people who did.
- Speeches, diaries, letters, and interviews - what the people involved said or wrote.
- Original research.
- Datasets, survey data, such as census or economic statistics.
- Photographs, videos, or audio that capture an event.

The primary sources for the development of the Asset Management Platform (AMP) are the project documents of the Saramacca Canal System Rehabilitation Project, which is financed through a loan with the World Bank Group. The Project Appraisal Document (PAD) (World Bank, 2018) defines the expected results of this sub-project.

The key stakeholder interviews will be part of the primary source to further define the expected deliverables and the quality thereof.

3.1.2 Secondary sources

Secondary Sources are one step removed from primary sources, though they often quote or otherwise use primary sources. They can cover the same topic, but add a layer of interpretation and analysis. Secondary sources can include: (Healy Library, 2021)

- Most books about a topic.
- Analysis or interpretation of data.
- Scholarly or other articles about a topic, especially by people not directly involved.
- Documentaries (though they often include photos or video portions that can be considered primary sources).

For the FGP the secondary source will consist of using a survey from the stakeholders and analyzing the data thereof. In addition, practical guides and information on other existing platforms will be used to create the project Management Plan.

Chart 2 Information sources (Source: compiled by author)

Objectives	**Information sources**	
	Primary	**Secondary**
To develop the Project Charter for the project, to define the project objectives	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	Stakeholder Survey Asset Management Platforms: https://www.assetmanagementexpert.com/flood-risk-management-system
To develop a Scope Management Plan, which defines the work needed to	Project Appraisal Document (World Bank, 2018)	PMBOK Guide 6th Edition (PMI, 2017)

Objectives	Information sources	
	Primary	**Secondary**
be done to achieve the deliverables of the project	Interviews Key Stakeholders	Practice Standard for Project Estimating 2nd Edition (PMI, 2019)
To develop a Schedule Management Plan, which determines the project duration	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017)
To develop a Stakeholder Management Plan, in order to help the project team to identify and manage stakeholder engagement	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017)
To develop a Resource Management Plan for the AMP, which will access which resources are available internally or externally to execute the project	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017) Survey data analysis
To develop the Procurement Management Plan for the scope of the project, which will describe the method and processes	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017)

Objectives	Information sources	
	Primary	**Secondary**
needed to access and contract external resources and supplies		Procurement Regulations for IPF Borrowers (World Bank Group, 2020)
To develop the Quality Management Plan, which will set the quality parameters and the procedures to control the quality of the project.	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017) Survey data analysis Project Quality Management, Why, What and How 2nd Edition (Rose, K., 2014)
To develop a communication management plan for the stakeholders, which will define the strategy for internal en external communication	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017) Survey data analysis
To develop a Risk Management Plan for the project, which will identify procedures to enable the team to manage the risk for the project.	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017) Survey data analysis Practice Standard for Project Risk Management (PMI, 2009)
To develop a cost estimate for the project, in order to calculate the project cost and procedure to evaluate	Project Appraisal Document (World Bank, 2018) Interviews Key Stakeholders	PMBOK Guide 6th Edition (PMI, 2017) Survey data analysis

Objectives	Information sources	
	Primary	**Secondary**
the earned value of the project.		The Standard for Earned Value Management (PMI, 2019) Practice Standard for Project Estimating 2nd Edition (PMI, 2019)

3.2 Research methods

Research methods are the strategies, processes, or techniques utilized in the collection of data or evidence for analysis to uncover new information or create a better understanding of a topic. There are different types of research methods that use different tools for data collection. (The University of Newcastle, 2019) The main types are Qualitative, Quantitative, and Mixed Method research.

3.2.1 Qualitative research

Qualitative Research gathers data about lived experiences, emotions or behaviors, and the meanings individuals attach to them. It assists in enabling researchers to gain a better understanding of complex concepts, social interactions, or cultural phenomena. This type of research is useful in the exploration of how or why things have occurred, interpreting events, and describing actions. (The University of Newcastle, 2019)

3.2.2 Quantitative Research

Quantitative Research gathers numerical data which can be ranked, measured, or categorized through statistical analysis. It assists with uncovering patterns or relationships, and for making generalizations. This type of research is useful for finding out how many, how much, how often, or to what extent. (The University of Newcastle, 2019)

3.2.2 Mixed Method Research

Mixed Methods Research integrates both Qualitative and Quantitative Research. It provides a holistic approach combining and analyzing the statistical data with deeper contextualized insights. Using Mixed Methods also enables triangulation, or verification, of the data from two or more sources. (The University of Newcastle, 2019)

- The summary of research methods must be shown in a chart such as chart 3 below.

Chart 3 Research methods (Compiled by author)

Objectives	Research methods		
	Qualitative Research	**Quantitative research**	**Mixed-Method Research**
To develop the Project Charter for the project, to define the project objectives.	Information will be obtained from interviews with key stakeholders.		
To develop a Scope Management Plan, which defines the work needed to be done to achieve the deliverables of the project.			Data from interviews with stakeholders will be combined with data from existing similar projects to define the scope management plan of the project.
To develop a Schedule Management Plan, which		Analysis from similar type	

Objectives	Research methods		
	Qualitative Research	**Quantitative research**	**Mixed-Method Research**
determines the project duration.		projects will be used to complete the schedule management plan.	
To develop a Stakeholder Management Plan, to help the project team identify and manage stakeholder engagement.	Interviews and a stakeholder survey will be implemented to complete the stakeholder management plan.		
To develop a Resource Management Plan for the AMP, which will access which resources are available internally or externally to execute the project.		Analysis from similar type projects will be used to compile the resource management plan.	
To develop the Procurement Management Plan for the scope of the project, which will describe the			From a combination of the procurement guidelines and

Objectives	Research methods		
	Qualitative Research	Quantitative research	Mixed-Method Research
method and processes needed to access and contract external resources and supplies.			the best practices, the optimum solution will be created to define the procurement management plan.
To develop the Quality Management Plan, which will set the quality parameters and the procedures to control the quality of the project.		The parameters for quality will be derived from other similar projects and will be applied to the quality management plan for this project.	
To develop a communication management plan for the stakeholders, which will define the strategy for internal en external communication.		From similar types of projects, a communication management plan will be developed.	

Objectives	Research methods		
	Qualitative Research	**Quantitative research**	**Mixed-Method Research**
To develop a Risk Management Plan for the project, which will identify procedures to enable the team to manage the risk for the project.	Information will be obtained from interviews with key stakeholders.		
To develop a cost estimate for the project, to calculate the project cost and procedure to evaluate the earned value of the project.		The cost of similar types of projects will be used as a basis to develop the Cost estimates for this project.	

3.3 Tools

The PMBOK guide 6th edition (2017) definition of a tool is: “Something tangible, such as a template or software program, used in performing an activity to produce a product or result. (PMI, 2019 p.725)

Chart 4 Tools (Source PMBOK Guide 6th edition, 2017)

Objectives	Tools
To develop the Project Charter for the project, in order to define the project objectives.	Brainstorming Document analysis Expert Judgement Meetings
To develop a Scope Management Plan, which defines the work needed to be done to achieve the deliverables of the project.	Interviews Benchmarking Document analysis Decomposition
To develop a Schedule Management Plan, which determines the project duration.	Dependency determination & Integration Expert Judgement Benchmarking
To develop a Stakeholder Management Plan, in order to help the project team to identify and manage stakeholder engagement.	Brainstorming Stakeholder analysis: Power, interest, influence.
To develop a Resource Management Plan for the AMP, which will access which resources are available internally or externally to execute the project.	Expert judgment Analogous estimating Responsibility assignment matrix

Objectives	Tools
To develop the Procurement Management Plan for the scope of the project, which will describe the method and processes needed to access and contract external resources and supplies.	Market research Expert judgment Meetings
To develop the Quality Management Plan, which will set the quality parameters and the procedures to control the quality of the project.	Benchmarking Checklists Affinity diagrams Flowcharts Multi-Criteria decision analysis
To develop a communication management plan for the stakeholders, which will define the strategy for internal and external communication.	Stakeholder engagement assessment matrix Meeting management Communication methods Communication technology
To develop a Risk Management Plan for the project, which will identify procedures to enable the team to manage the risk for the project.	Brainstorming Checklists Interviews Assumption and constraint analysis Risk probability and impact assessment
To develop a cost estimate for the project, to calculate the project cost and procedure to evaluate the earned value of the project.	Earned value analysis Reserve analysis Analogous estimating Three-point estimating

3.4 Assumptions and constraints

The PMBOK Guide 6th edition defines assumptions as, a factor in the planning process that is considered to be true, real, or certain, without proof or demonstration.

A constraint is a limiting factor that affects the execution of a project, program, portfolio, or process. (PMI, 2017 *p.701*)

For the AMP project, within the context of the FGP, the assumptions and constraints are listed in the following chart.

Chart 5 Assumptions and constraints (Source compiled by author)

Objectives	Assumptions	Constraints
To develop the Project Charter for the project, to define the project objectives.	Information is readily available. Stakeholder participation is timely	Time to complete FGP.
To develop a Scope Management Plan, which defines the work needed to be done to achieve the deliverables of the project.	All deliverables are definable.	Stakeholders participation and input on time within the FGP period.
To develop a Schedule Management Plan, which determines the project duration.	Documents of similar projects are available.	Resources not available to complete Schedule.
To develop a Stakeholder Management Plan, to help the project team identify and manage stakeholder engagement.	All stakeholders will be identified.	Information not available to complete analysis.
To develop a Resource Management Plan for the AMP, which will access which resources are available internally or externally to execute the project.	Documents of similar projects are available.	Resources not available on time.
To develop the Procurement Management Plan for the scope of the project, which will describe the method and processes needed to access and contract external resources and supplies.	Documents of similar projects are available.	Stakeholders not responding in a timely way to requests.
To develop the Quality Management Plan, which will set the quality parameters and the	Documents of similar projects are available.	MCA decision can not adequately be implemented.

Objectives	Assumptions	Constraints
procedures to control the quality of the project.		
To develop a communication management plan for the stakeholders, which will define the strategy for internal en external communication.	Stakeholders will remain the same.	Resources.
To develop a Risk Management Plan for the project, which will identify procedures to enable the team to manage the risk for the project.	All foreseeable risks will be identified and analyzed.	Time to complete within FGP period.
To develop a cost estimate for the project, to calculate the project cost and procedure to evaluate the earned value of the project.	Documents of similar projects are available. Three-point analysis is preferable.	Time to complete within FGP period. The scope should not change.

3.5 Deliverables

The PMBOK Guide, 6th Edition defines a deliverable as any unique and verifiable product, result, or capacity to perform a service that is required to be produced to complete a process, phase or project. (PMI, 2019 p.704)

To complete the FGP all deliverables should be identified and are stated in the following chart.

Chart 6 Deliverables (Source compiled by author)

Objectives	Deliverables
To develop the Project Charter for the project, to define the project objectives.	The Project Charter for the AMP project.
To develop a Scope Management Plan, which defines the work needed to be done to achieve the deliverables of the project.	The Scope Management Plan, to identify the scope of the project.
To develop a Schedule Management Plan, which determines the project duration.	Project Schedule, programmed in MS Project.
To develop a Stakeholder Management Plan, to help the project team identify and manage stakeholder engagement.	The analysis matrix of the stakeholder and stakeholder engagement plan.
To develop a Resource Management Plan for the AMP, which will access which resources are available internally or externally to execute the project.	Develop a Resource management plan.
To develop the Procurement Management Plan for the scope of the project, which will describe the method and processes needed to access and contract external resources and supplies.	A document analyzing the resources needed and where to acquire these.

Objectives	Deliverables
To develop the Quality Management Plan, which will set the quality parameters and the procedures to control the quality of the project.	The Quality Management plan, including the checklists to manage the quality.
To develop a communication management plan for the stakeholders, which will define the strategy for internal en external communication.	The document defines the communication types and methods to be used on the project.
To develop a Risk Management Plan for the project, which will identify procedures to enable the team to manage the risk for the project.	A document that will enable the project team to deal with the project risks.
To develop a cost estimate for the project, to calculate the project cost and procedure to evaluate the earned value of the project.	A document to define the project budget, management reserve, costs, and earned value method.

RESULTS

4.1 Integration Plan

Two main activities within the preparation of the project are the development of the project charter and the integrated change control.

4.1.1 Project Charter

To develop this charter a brainstorming session was held with the members of the Saramacca Canal Unit, to define the project objectives. This was verified in a meeting with the representative of the employer, being the PS of Public Works.

Chart 7 Project Charter (source compiled by author)

UCI Universidad para la Cooperación Internacional		GSPM UCI Global School of Project Management Escuela Global de Dirección de Proyectos Escola Global de Gerenciamento de Projetos
PROJECT CHARTER		
Date:	**Project Name:**	
August 10th, 2021	Creating an Asset Management Platform (AMP) enabling efficient usage of the stormwater drainage system	
Knowledge Areas / PM Processes:	**Application Area (Sector / Activity):**	
	Information Technology	
Knowledge Areas:		
Scope Management		

Schedule Management	
Resource Management	
Quality Management	
Cost Management	
Communication Management	
Risk Management	
Stakeholder Management	
Procurement Management	
PM Processes:	
Initiation	
Planning	
Project Start Date:	**Project Finish date:**
November 1st, 2021	April 1st, 2024
Project Objectives (General and Specific):	
General Objective:	
To create an Asset Management Platform to enable efficient management of stormwater drainage in Paramaribo, Suriname.	
Specific Objectives:	
1. To hire a specialized firm to create the AMP for Paramaribo.	
2. To collect and adapt historical Hydro-Met data for usage in the AMP.	
3. To design a working AMP for Paramaribo, which also creates flood maps.	
4. To create an AMP online portal for users to access data on flooding events.	
5. To hire a contracting firm to supply and install new Hydro-Met Stations.	
6. To install new Hydro-Met stations within the Paramaribo Area.	

Project purpose or justification (merit and expected results):
The Ministry of Public Works is responsible for stormwater management for the district of Paramaribo. Within the stormwater system of canals and culverts, the Saramacca Canal is the most essential drainage infrastructure, as it influences nearly 40% of the area of the district. Till now information about flooding is not readily available and information is scattered. The general public has to get information from several sources and piece it together themselves. To ensure the data and the representation of it is correct, this project will combine existing mapping, with rainfall data as well as stormwater flow data, retrieved from canals, sluices, and pumping stations, to accurately predict flooding events from rainfall. For the general public, it can help them prepare better in case of heavy rains and for the government, the database will help plan resources and funding toward improvements in flooding-prone areas.
Description of Product or Service to be generated by the Project – Project final deliverables:
The project will generate the following products and services: 1. Contract a consulting firm to create the AMP.
2. Hire a contracting firm for the supply and installation for additional Hydro-Met Stations.
3. Purchase and adapt the best suitable AM Platform for the Paramaribo situation.
4. Collect and adapt historical Hydro-Met Data to use on AMP.
5. Supply and Installation of new hydro-Met stations.
6. Having the AMP online, with access via various mobile and desktop devices.
Assumptions:
The geotechnical survey data is correctly collected and processed.
Existing AM platforms are suitable for adaptation.
The Ministry of Public Works will continue upgrading the system during operations.

The procurement of companies to perform the works is successful at the first go.
Constraints:
The project budget is sufficient to complete the project.
Timing of activities is not interrupted, otherwise, calibration is not possible.
Preliminary Risks:
If the stakeholder engagement sessions are not optimal, information about specific areas could be missed and the flood maps calibration could be affected negatively.
If the installation of additional hydro-met stations is not completed within the estimated timeframe, calibration of the AMP cannot be done, during the rainy season, which could delay the project for a minimum of 6 months.
If the Geotechnical data is not collected correctly, the quality of the flood mapping will be negatively affected, making the AMP project unsuccessful.
Budget:
The total estimated budget is USD 1,500,000.00

Main component	Estimates	
1. Buying AMP hardware\software	USD 335,000.00	
2. Expanding hydrological and Meteorological stations	USD 660,000.00	
3. Consulting services costs to deliver a working AMP	USD 450,000.00	
4. Contingencies	USD 55,000.00	

Milestones and dates:		
Milestone	**Start date**	**End date**
Start	November 1st, 2021	
Buying selected AMP	October 11th, 2022	Nov 11th, 2022
Installation of additional Hydro-Met stations	February 9th, 2023	August 23rd, 2023
1st created floodmap	February 2023	End of February 2023
AMP online	March 1st, 2024	
End of project		April 1st, 2024
Relevant historical information:		
The Ministry of Public Works is the department of the Government responsible for urban drainage in nearly all of the Republic of Suriname. From this responsibility, discussions were started in 2014 with the World Bank to finance projects aiming to reduce disaster risks. From the following analysis, done by independent engineering firms contracted through the World Bank, the Saramacca canal System was selected as being the most vulnerable infrastructure within the system of stormwater management. Furthermore, the information availability of identifying flood areas and flood hazard areas are not well known to outsiders. To better inform the public and other relevant stakeholders the Ministry has decided to allow access to data regarding this matter. Through the use of an online platform different stakeholders will be able to get different levels of data to inform or use for other studies. Within the Ministry of Public Works, there has not been any sustainable web data portals till now and this project will be the first on such a scale.		

Stakeholders:	
Direct stakeholders: Ministry of Public Works, Hydrological Research Division, Meteorological Service Division, Drainage Division, National Disaster Relief Center Suriname, Saramacca Canal Unit (PMO), World Bank. **Indirect stakeholders:** Users of Saramacca Canal, District Commissioners, students, residents of Paramaribo, Engineering firms, local governmental agencies, neighborhood organizations.	
Approval:	
Project Manager:	Signature: Saramacca Canal Unit Director
Authorized by:	Signature: The Permanent Secretary of the Ministry of Public Works, Directorate of Civil Engineering Works

4.1.2 Integrated Change Control

The SCU will be tasked with the review of all change requests. The review will judge the impact on the triple constraints, time, costs, and scope of the project.
For this project, there are three levels of approvals.

Level 3:

- This is the lowest level
- Change requests are reviewed by the SCU team member and can only be approved if they have a positive impact on the quality, without affecting the contract value, time or scope.
- Changes are logged and communicated with the SCU and project Sponsor.

Level 2:

- The SCU will review these requests and advise the project sponsor.
- The total costs and time are still within the allocated budget and loan period.
- If the changes require additional time or costs as per the contract clauses, these changes should also be communicated with the World Bank.
- Once the sponsor gets approval from the World Bank, the changes can be made.
- Scope changes are not allowed within this level.

Level 1:

- If the change request requires a scope change of the project,
- Approval of the World Bank is needed through the Ministry of Finance.
- The Loan agreement needs to be adjusted.
- Additional funding may be required through restructuring the loan agreement
- After approval from the World Bank, the Project Sponsor can approve the change of Scope.

4.2 Scope Management Plan.

The Scope Management Plan for the creation of the Asset Management Platform will have three (3) aspects:

1. The requirements of the project deliverables.
2. The Work Breakdown structure.
3. The tool to validate the Scope.

This paragraph is compiled using an SCU brainstorming session and an interview with a World Bank expert, Mr. Adri Verweij, (who lives in Amsterdam, The Netherlands, personal communication June 29th, 2021 via MSTeams) on the subject of AMP.

4.2.1 Project deliverable requirements

The project has six (6) main deliverables:

1. Service contract with a consulting firm
2. A supply and installation contract
3. A working Asset Management Platform (AMP)
4. Existing Hydro-met data adapted for the AMP
5. Hydro-Met stations installed and operational
6. The AMP services are available online.

Chart 8 Requirements table AMP (Source: compiled by author)

	Deliverable	Requirements
1	Service contract with consulting firm	• The firm has the experience of a minimum of 2 similar projects. • The contract value is within the allocated budget. • The firm has proof of completed projects within the allowed time.
2	Supply and installation contract Hydro-Met Stations	• The company is accustomed to working in tropical climate countries on at least 2 projects within the last 5 years. • The company has proof of knowledge of installing hydro-Met Stations within the past 5 years.
3	Base Asset Management Platform	• Asset Management Platform suitable for low lying, flat areas. • AMP should be accessible via various platforms and operating systems. • The accuracy of the model should be >85% after calibration. • The AMP should allow for modular expansion of assets.
4	Existing Hydro-met data adapted for the AMP	• Collect, categorize data and create a database for over 30 years of data. • Convert to AMP requirements.

5	Installed Hydro-Met stations	• Hydro-Met stations should be placed within a 10m radius from the defined locations. • The system should have redundancy to prevent data losses. • Water levels measured should be within a 1 cm accuracy. • Rainfall data measured should be within a 1 mm accuracy.
6	The online version of AMP	• The AMP online version should have various degrees of accessibility, depending on the use. • The AMP should be easy to use. • A mobile application for access should be developed.

In chapter 4.9 these requirements are further defined in the quality management plan, see chart 14.

4.2.2 Work Breakdown Structure

For this project, the WBS was created using the 100% rule to capture all deliverables in level 1 of the structure. Level 2 contains the “Elements” which break down the deliverables into manageable parts. This project has 31 elements. Some of the elements will be executed by the project team, the SCU, namely 1.1.1 till 1.15 and 1.2.5 and 1.2.6. All other Elements will be executed by other parties under project management by the SCU.

The final part of the WBS is the creation of the WBS Dictionary for the level 1 and 2 of the WBS. This project will have 37 WBS Dictionaries.

For the development of the WBS, the SCU had a brainstorming session with a WB expert, Mr. Adri Verweij, (lives in Amsterdam, The Netherlands, personal communication June 29th 2021 via MSTeams) who has worked on similar projects in Indonesia and Guyana.

Chart 9 WBS Dictionary template (Source: https://www.workbreakdownstructure.com/wbs-dictionary)

No.	Item	Description
1	WBS Code	Enter the WBS Title
2	Responsible Organization/ Individual	Name the single organization, group, or individual that has been assigned sole responsibility for making sure the Work Package is completed. Include contact information.
3	Description	Define Work Package boundaries. Frame the scope content so that it is clear what scope is included and excluded. If it is a Planning Package, describe the known and unknown scope.
4	Deliverables	Identify the product, service, or results created when all of the work in this Work Package is complete. Include any critical intermediate deliverables.

5	Acceptance Criteria	Describe the functional and physical requirements to meet customer expectations and quality requirements. Include any unique approvals required for acceptance.		
6	Budget	Designate the budget for this Work Package, plus any critical resource information and assumptions.		
7	Milestones	List any Start Dates, End Dates, Intermediate Milestones, Interdependencies, Constraints, and any assumptions for the deliverables.		
8	Risks	Include any known threats and opportunities with response strategies.		
9	Additional Information	Describe any additional information, such as references, related work packages, etc.		
10	Approvals:		Date:	Rev:

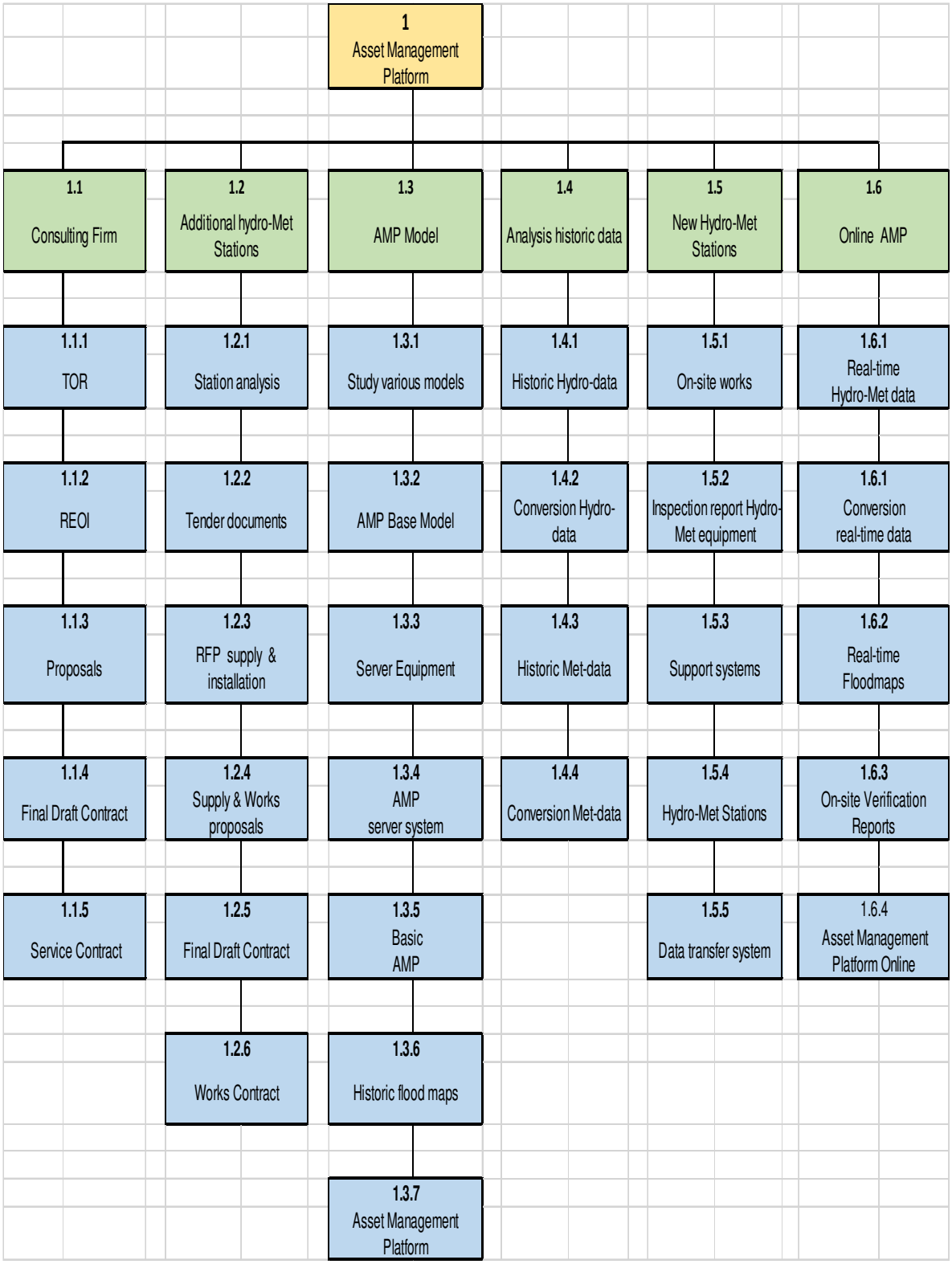
1
Asset Management Platform
1.1
Consulting Firm
1.2
Additional hydro-Met Stations
1.3
AMP Model
1.4
Analysis historic data
1.5
New Hydro-Met Stations
1.6
Online AMP
1.1.1
TOR
1.2.1
Station analysis
1.3.1
Study various models
1.4.1
Historic Hydro-data
1.5.1
On-site works
1.6.1
Real-time Hydro-Met data
1.1.2
REOI
1.2.2
Tender documents
1.3.2
AMP Base Model
1.4.2
Conversion Hydro-data
1.5.2
Inspection report Hydro-Met equipment
1.6.1
Conversion real-time data
1.1.3
Proposals
1.2.3
RFP supply & installation
1.3.3
Server Equipment
1.4.3
Historic Met-data
1.5.3
Support systems
1.6.2
Real-time Floodmaps
1.1.4
Final Draft Contract
1.2.4
Supply & Works proposals
1.3.4
AMP server system
1.4.4
Conversion Met-data
1.5.4
Hydro-Met Stations
1.6.3
On-site Verification Reports
1.1.5
Service Contract
1.2.5
Final Draft Contract
1.3.5
Basic AMP
1.5.5
Data transfer system
1.6.4
Asset Management Platform Online
1.2.6
Works Contract
1.3.6
Historic flood maps
1.3.7
Asset Management Platform

Figure 8 Work Breakdown Structure for the Asset Management Platform. Source compiled by the author, 2021.

4.2.3 Validate Scope

The validation of the scope will follow the following methodology.

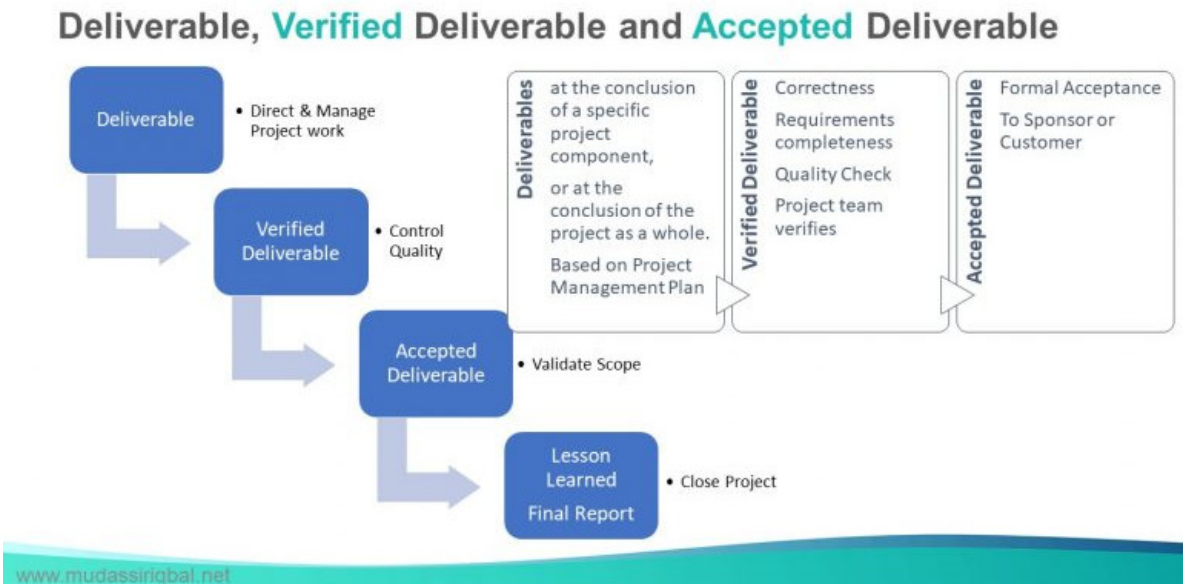

Figure 9 Scope Validation steps. Source **https://mudassiriqbal.net/validate-scope-and-control-quality/, 2019**.

For the AMP the following parties are responsible for the validation of the deliverables:

- The SCU will validate the deliverables which derive from the contract with the consultant for the various services.

- The Consultant will validate the deliverables of the other parties and, the consultant should report the progress and prepare the final acceptance letter for the SCU.

The formal acceptance will be signed by the sponsor, which is the Ministry of Public Works.

4.3 Schedule Management Plan

From the WBS the schedule management plan can be created, which can be achieved by creating the following steps:

1. Define activities
2. Define the sequence of activities
3. Estimate duration
4. Create schedule

4.3.1 Define activities

Chart 10 Activity List

WBS	Task Name	Duration	Predecessors
1	**Start AMP**	**568 days**	
1.1	**Procurement Consulting Services**	**156 days**	
1.1.1	**Prepare TOR**	**17 days**	
1.1.1.1	Write TOR	14 days	
1.1.1.2	No-objection WB TOR	3 days	4
1.1.2	**REOI**	**11 days**	
1.1.2.1	Prepare Tender Document	7 days	5
1.1.2.2	No-objection WB REOI	3 days	7
1.1.2.3	Publish invitation	1 day	8
1.1.3	**Tender Services**	**99 days**	
1.1.3.1	receive EOI	28 days	9
1.1.3.2	Evaluate EOI	14 days	11
1.1.3.3	Short list	1 day	12
1.1.3.4	No-objection WB Shortlist	3 days	13
1.1.3.5	letter to shorlisted firms	1 day	14
1.1.3.6	information session	1 day	15FS+14 days
1.1.3.7	receive bids	1 day	16FS+28 days
1.1.3.8	evaluate bids	5 days	17
1.1.3.9	no-objection WB contract phase	3 days	18

From the activity list, the duration of each activity can be estimated and the total duration of the project can be calculated. The full chart is located in the appendices, appendix no. 5. Activity list.

4.3.2 Define the sequence of activities

For each activity, the SCU will use available data from past projects and expert judgment to sequence the activities. For the procurement procedures, the World Bank guidelines, Procurement Regulations for IPF Borrowers, November 2020, will be leading.

WBS	Task Name	Duration	Predecessors
1	**Start AMP**	**568 days**	
1.1	**Procurement Consulting Services**	**156 days**	
1.1.1	**Prepare TOR**	**17 days**	
1.1.1.1	Write TOR	14 days	
1.1.1.2	No-objection WB TOR	3 days	4
1.1.2	**REOI**	**11 days**	
1.1.2.1	Prepare Tender Document	7 days	5
1.1.2.2	No-objection WB REOI	3 days	7
1.1.2.3	Publish invitation	1 day	8
1.1.3	**Tender Services**	**99 days**	
1.1.3.1	receive EOI	28 days	9
1.1.3.2	Evaluate EOI	14 days	11
1.1.3.3	Short list	1 day	12
1.1.3.4	No-objection WB Shortlist	3 days	13
1.1.3.5	letter to shorlisted firms	1 day	14
1.1.3.6	information session	1 day	15FS+14 days
1.1.3.7	receive bids	1 day	16FS+28 days
1.1.3.8	evaluate bids	5 days	17
1.1.3.9	no-objection WB contract phase	3 days	18

Figure 10 AMP Sequence of activities (Source: compiled by author)

4.3.3 Estimate duration

The Duration of each activity is calculated. Estimating the time for each activity from previous projects and interviews with experts on specific matters such as ICT experts. The SCU will coordinate these sessions, which will also lead to the data to input in estimating pessimistic and optimistic scenarios for each activity.

From these scenarios, different analyses can be done to determine a critical path for the project.

The total project will take approximately 568 days, and starts on November 1st, 2021 till April 1st, 2024. The estimate excludes recognized holidays, such as Christmas, New Year, Easter, etc., and weekends.

4.3.4 Create schedule

From the initial data gathered the project schedule is created, which will function as the baseline for the project.

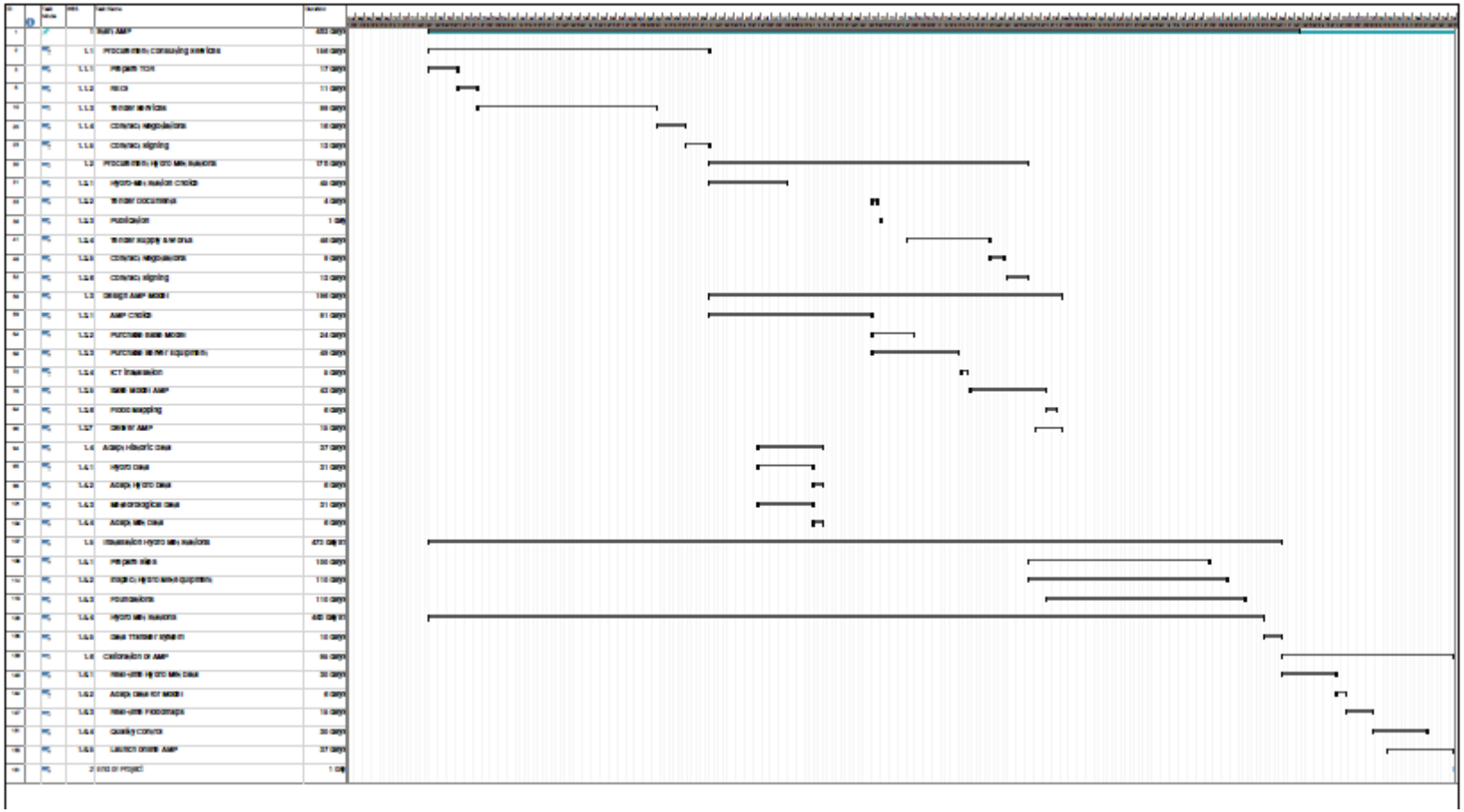

Figure 11 Baseline Schedule AMP

The complete schedule for this project is part of the appendices, appendix no. 6 Schedule

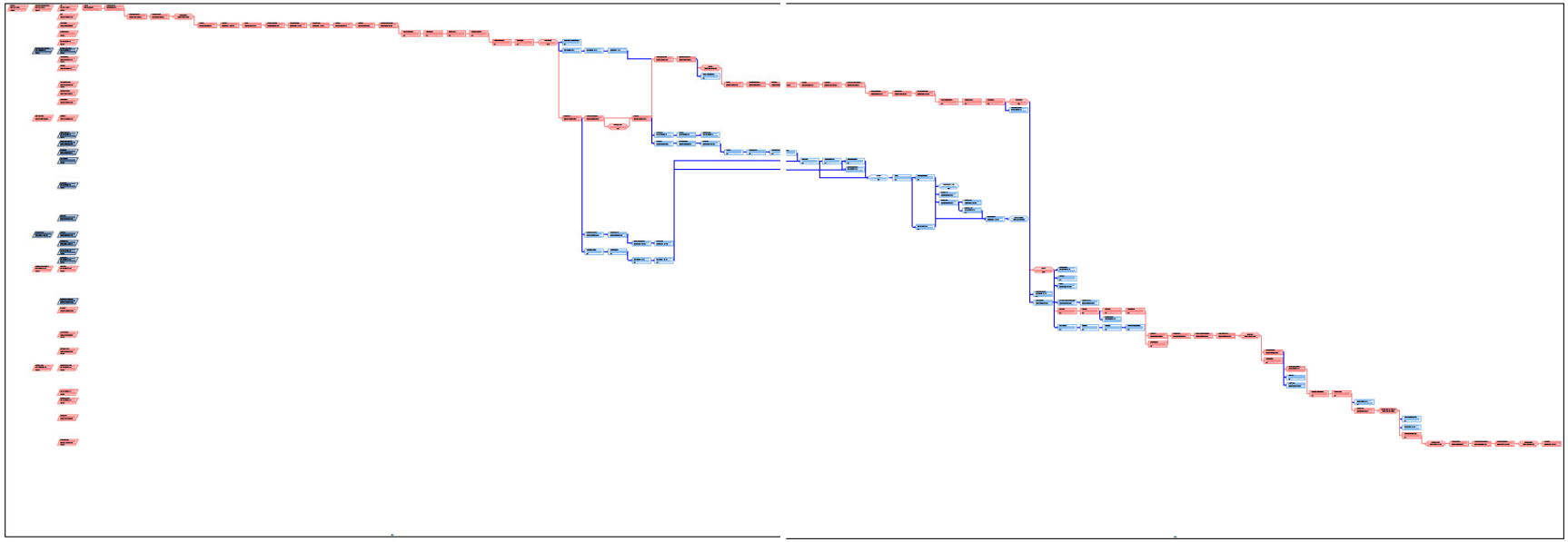

Figure 12 Network Diagram AMP (source: compiled by Author)

From the WBS the network diagram is derived, identifying the critical path activities (which are colored red in the figure 12). The network diagram shows the following WBS activities are on the critical path:

Deliverable	**Critical Path actions**
Procurement Service firm :	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5
Procurement Hydro-Met Stations:	1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.2.6
Design AMP:	1.3.1
New Hydro-Met Stations:	1.5.1.1, 1.5.3.1, 1.5.4.1, 1.5.4.4, 1.5.4.5, 1.5.5.2
Calibration of AMP:	1.6.1, 1.6.2, 1.6.3.2, 1.6.3.3, 1.6.4

A readable Network diagram is part of the appendices, appendix no. 7: Network Diagram AMP

4.4 Resource Management Plan

For the project, the SCU will finalize and update the Resource Management Plan as needed during the execution of the Project.

The Project resources will be from:

1. Internally: The SCU
2. Externally: consulting firms; supply companies; contractors; test users.

4.4.1 Internal resources

The SCU is seen as the internal organization, which executes the project. They are responsible for the successful completion of the project.

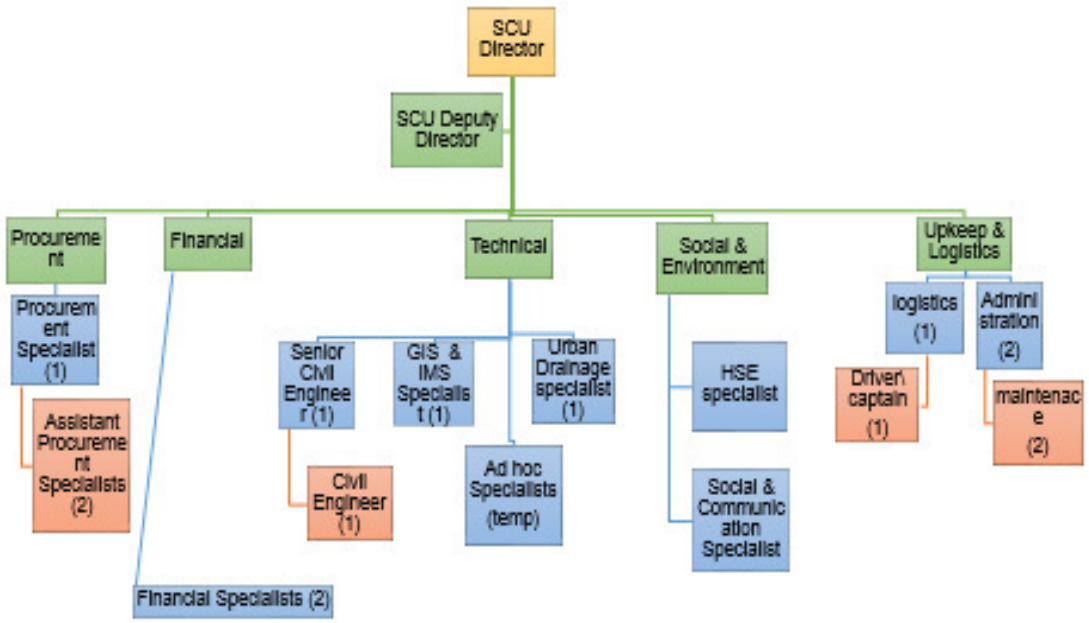

Figure 13 Organizational Chart SCU

The members of the SCU who are responsible for this project are:

SCU Director, SCU deputy director, Procurement Specialist, Financial specialists, the senior Civil Engineer, GIS & IMS specialist, HSE, and Social and Communication specialist.

For the members of the SCU, a responsibility assignment matrix (RAM) or R(esponsible) A(ccountable) C(onsulted) I(nformed) chart is developed to manage the different work packages of the WBS.

	WBS 1.1. Procurement Consulting Services																					
	1.1.1. TOR		1.1.2. REOI			1.1.3. Tender services									1.1.4 Contract Negotiations				1.1.5 Contract signing			
	1.1.1.1	1.1.1.2	1.1.2.1	1.1.2.2	1.1.2.3	1.1.3.1	1.1.3.2	1.1.3.3	1.1.3.4	1.1.3.5	1.1.3.6	1.1.3.7	1.1.3.8	1.1.3.9	1.1.4.1	1.1.4.2	1.1.4.3	1.1.4.4	1.1.5.1	1.1.5.2	1.1.5.3	1.1.5.4
	Write TOR	NO WB TOR	Write REOI	NO WB REOI	Publish REOI	recveive EOI	evaulate EOI	Shortlist	NO WB shortlist	letters to bidders	Information session	receive Bids	Evaluate Bids	NO WB contract phase	Letter succesful bidder	start negotiations	Final draft contract	NO WB contract	Notification of award	Stand still period	contract signing	upload contract WB
SCU Director	I	A		A		I		I	A	R		I	I	A	R	I	I	A		A	A	
SCU Deputy Director	R	C	I	C		I	I	I	C	I	AR			C	I	AR	R	C	R	R	R	R
Procurement Specialist	C		AR		AR	R	AR	AR			C	R	AR			R	AC			C		
Assistant Procurement Specialist			C		C		R	R				C	C			I	C			I		
Financial specialists			I								I					R				I		
Senior Civil Engineer	AR		C			I	R	I			C		C			C						
GIS & IMS Specialist	R		C			I	C	I			C		R			C						
HSE specialist	C		C								C					C						
Social & Communication Specialist	I		C								C					C						

Figure 14 RAM for the Engineering services

From the RAM it can be derived that the SCU Director has the overall responsibility of the project, and is accountable for the results of the SCU towards the World Bank.

The SCU Deputy Director is responsible for the technical aspects of this phase and should consult, inform and manage the technical and specialistic staff.

This format of the RAM will be applied to the other work packages of the WBS.

4.4.2 SCU Team development

To develop the SCU team the following measures will be taken:

- **Colocation**:

The SCU office building will be available for all permanent SCU members to perform their part of the work. For temporary staff, the building has additional working spaces. For meetings, the office building has conference facilities and small meeting rooms.

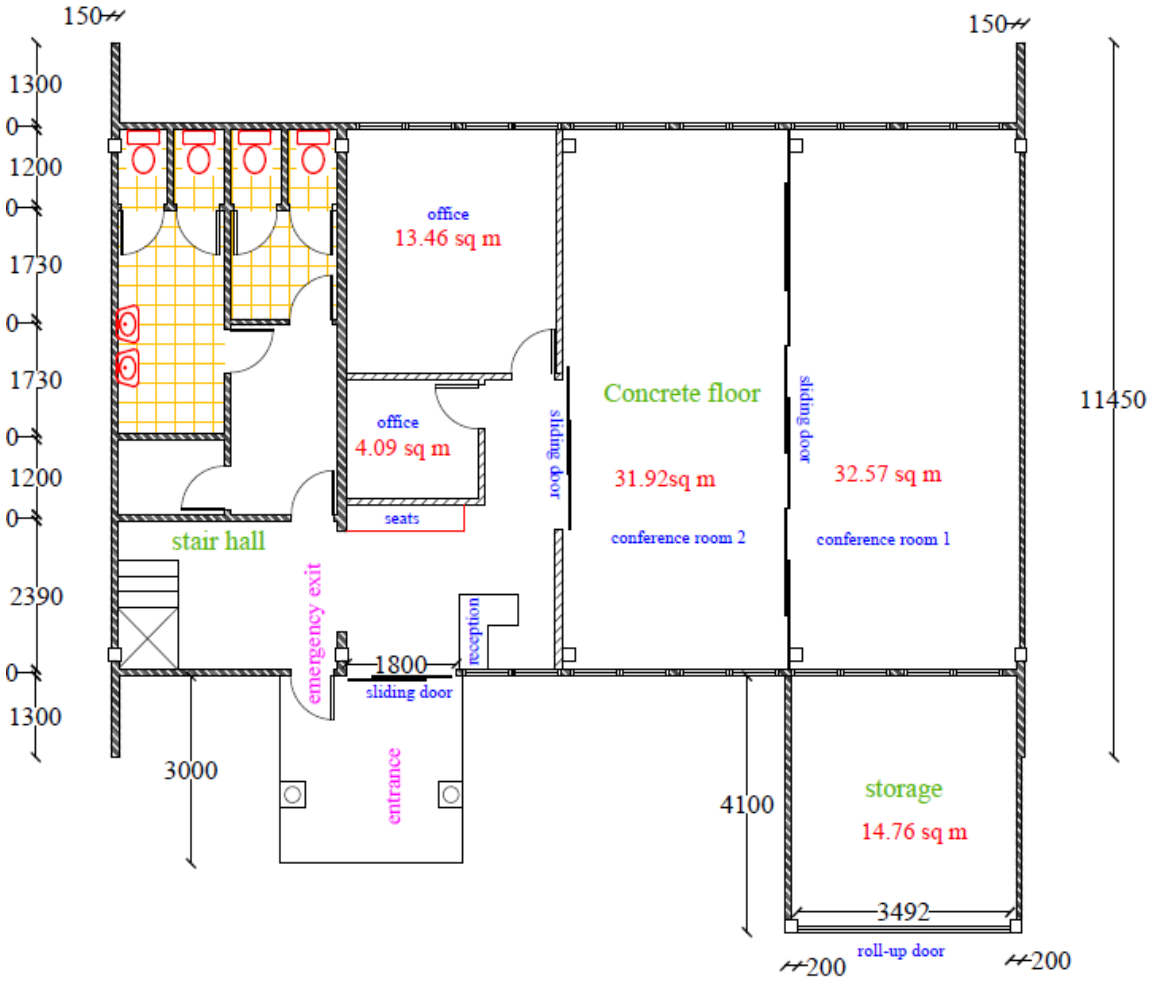

Figure 15 Floorplan SCU building: groundfloor (Source Mohangoo, 2020. Project documents SCSRP)

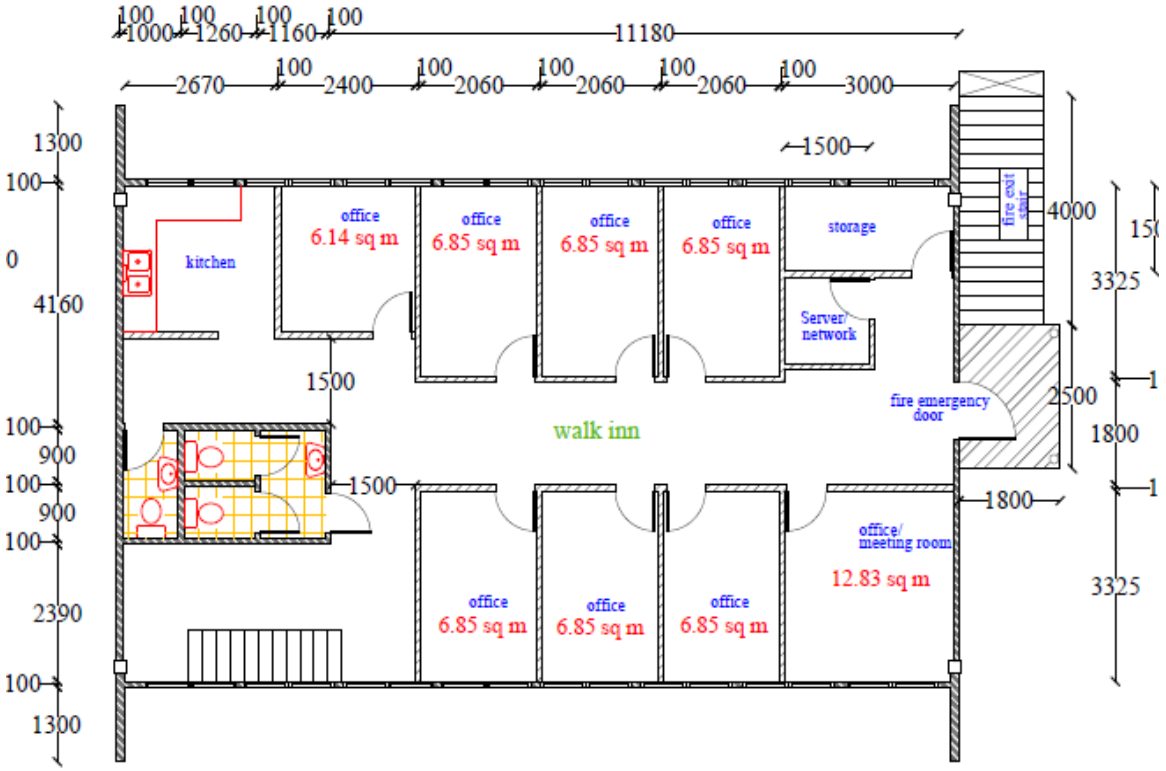

Figure 16 Floorplan SCU building: First Level (Source: Mohangoo, 2020. Project documents SCSRP)

- **Communication**

In the communication plan, chapter 4.7 and chart 14 a detailed overview of the application of each type of communication method developed

The SCU will use the following tools to communicate:

(a) Formal letters: Contractual communications will be done through letter exchange which should be registered and administered.

(b) Email Exchange: for information and non-contractual communication.

(c) Meetings:

- Virtual via MS Teams
- Physical

(d) Phone calls

(e) Whatsapp group chats.

- **Teambuilding**

The SCU will organize an annual informal team assessment off-site which will help the team-building process in a non-working environment.

Via the World Bank, various SCU members will participate in training on special courses such as procurement, auditing, contract management, and financing. These courses will have certifications that members can use for future projects.

4.4.3 External resources

External resources will be acquired using different methods and processes by the SCU or the main consulting firms.

Procurement

The SCU will use the World Bank procurement guidelines and, the operational manual for this project to acquire the following resources:

- The main consulting firm
- The contractor to build the additional Hydro-Meteorological stations
- The basic AMP model
- The ICT equipment to run the AMP
- Hydrological equipment
- Meteorological equipment

The procurement plan will specify the method of procurement, which is dependent on the cost estimate of the goods, works, or services. The specific tender documents will specify the requirements, quality, and quantities of the supply, work or service needed.

Stakeholder participation

Through the stakeholder meeting, the test participants will be acquired, who will provide feedback and valuable information on the online platform's performance and accessibility.

Consulting firm

The consulting firm will supply the human resources needed to select the correct basic AMP model, validate the results of the AMP, create flood maps, analyze and adapt historical and real-time Hydro-Met data to improve the AMP.

Suppliers

Various suppliers will be responsible for the on-time delivery of the crucial supplies such as:

- A dedicated server (computer)
- Digital water level sensors
- Rainfall gauges
- Software
- Mobile application software
- ICT equipment for data transfer

Construction firm

The contracted construction firm will be responsible to provide the resources needed to erect and install the hydro-met station at various locations within the area of influence of the AMP. The resources include:

- Building materials: concrete, rebar, wooden piles, steel structures, and fasteners.
- Building crews: personnel, heavy and light equipment.
- Transport and the logistics of the hydro-met supplies.

4.5 Cost Management Plan

4.5.1 Cost Estimate

The SCU will use the following tools to estimate the cost of each of the activities of the project. The total of each activity estimates will calculate the cost baseline for the project.

For the costs of consulting services:

The following table gives an overview of the method to estimate the costs of an activity:

Cost Estimate Consultancy services						
Task 1	**analysis AMP models & existing Hydro-met station**					
	Type of personnel	**no. of experts**	**Base Monthly fee**	**% time**	**total time**	**Amount**
Key	Senior Consultant	1	$9,000.00	50%	3	$ 13,500.00
	Hydrology model expert	1	$12,500.00	40%	3	$ 15,000.00
	Meterologist	1	$8,000.00	30%	3	$ 7,200.00
Junior staff	Statistician	1	$ 3,750.00	5%	3	$ 562.50
	Junior Engineer	1	$ 3,500.00	15%	3	$ 1,575.00
	Administrator	2	$ 1,250.00	15%	3	$ 1,125.00
Back office\ logistics	Consumables	1	$ 100.00	100%	3	$ 300.00
	Transport	1	$ 1.50	100%	9000	$ 13,500.00
	Other costs	1	$ 200.00	100%	3	$ 600.00
				Task 1 total		**$53,362.50**
Task 2	**AMP base model**					
	Type of personnel	**no. of experts**	**Base Monthly fee**	**% time**	**total time**	**Amount**
Key	Senior Consultant	1	$9,000.00	15%	5	$ 6,750.00
	Hydrology model expert	1	$12,500.00	40%	5	$ 25,000.00
	Programmers	2	$6,000.00	30%	5	$ 18,000.00
	Meteorologist	1	$8,000.00	10%	5	$ 4,000.00
	Model makers	1	$5,000.00	20%	5	$ 5,000.00
Junior staff	Junior Engineer	2	$ 3,500.00	15%	5	$ 5,250.00
	Administrator	2	$ 1,250.00	15%	5	$ 1,875.00
Back office\ logistics	Consumables	1	$ 100.00	100%	5	$ 500.00
	Transport	1	$ 1.50	100%	15000	$ 22,500.00
	Other costs	1	$ 200.00	100%	5	$ 1,000.00
				Task 2 total		**$ 89,875.00**

Task 3	Collect, analyse, categorize and convert existing Hydro-met Data					
	Type of personnel	**no. of experts**	**Base Monthly fee**	**% time**	**total time**	**Amount**
Key	Senior Consultant	1	$9,000.00	15%	1.5	$ 2,025.00
	Meteorologist	1	$8,000.00	40%	1.5	$ 4,800.00
	Hydrologist	1	$8,000.00	40%	1.5	$ 4,800.00
Junior staff	Data input staff	1	$ 3,000.00	33%	1.5	$ 1,485.00
	Satistician	1	$ 3,750.00	20%	1.5	$ 1,125.00
	Junior Engineer	2	$ 3,500.00	15%	1.5	$ 1,575.00
	Administrator	2	$ 1,250.00	15%	1.5	$ 562.50
Back office\ logistics	Consumables	1	$ 100.00	100%	1.5	$ 150.00
	Transport	1	$ 1.50	100%	4500	$ 6,750.00
	Other costs	1	$ 200.00	100%	1	$ 200.00
				Task 3 total		**$ 23,472.50**

Task 4	Supervise on site Hydro-met stations installations					
	Type of personnel	**no. of**	**Base Monthly**	**%**	**total**	**Amount**
Key	Senior Consultant	1	$9,000.00	10%	7	$ 6,300.00
	Hydrologist	1	$8,000.00	10%	7	$ 5,600.00
	Civil Engineer	2	$7,000.00	30%	7	$ 29,400.00
	Meteorologist	1	$8,000.00	10%	7	$ 5,600.00
Junior staff	Surveyor	2	$ 4,000.00	20%	7	$ 11,200.00
	Junior Engineer	2	$ 3,500.00	100%	7	$ 49,000.00
	Administrator	2	$ 1,250.00	25%	7	$ 4,375.00
Back office\ logistics	Consumables	1	$ 100.00	100%	7	$ 700.00
	Transport	1	$ 1.50	100%	42000	$ 63,000.00
	Other costs	1	$ 200.00	100%	7	$ 1,400.00
				Task 4 total		**$ 176,575.00**

Task 5	Online version AMP & Calibration					
	Type of personnel	**no. of experts**	**Base Monthly fee**	**% time**	**total time**	**Amount**
Key	Senior Consultant	1	$9,000.00	25%	5	$ 11,250.00
	Hydrology model expert	1	$12,500.00	25%	5	$ 15,625.00
	Programmers	2	$6,000.00	30%	5	$ 18,000.00
	Meteorologist	1	$8,000.00	15%	5	$ 6,000.00
	Hydrologist	1	$8,000.00	15%	5	$ 6,000.00
	Model makers	2	$5,000.00	30%	5	$ 15,000.00
Junior staff	Statistician	1	$ 3,750.00	33%	2	$ 2,475.00
	Junior Engineer	2	$ 3,500.00	100%	1	$ 7,000.00
	Administrator	2	$ 1,250.00	25%	1	$ 625.00
Back office\ logistics	Consumables	1	$ 100.00	100%	5	$ 500.00
	Transport	1	$ 1.50	100%	15000	$ 22,500.00
	Conference room rentals	1	$ 600.00	100%	4	$ 2,400.00
	Other costs	1	$ 200.00	100%	5	$ 1,000.00
				Task 5 total		**$ 108,375.00**
				General Total		**$ 451,660.00**

Figure 17 Cost estimate template (source: compiled by author)

For costs of works and supplies

The Ministry of Public Works uses a standard form to calculate the costs per activity/ item.

No.	Line item	Unit	A Amount	B Unit Price (USD)	A x B = C Total per item (USD)
1	**General costs**	month	10	7,500.00	75,000.00
2	**Meteorological stations**				
a	Steel tower	pc	10	900.00	9,000.00
b	Rainguage	pc	10	652.64	6,526.40
c	Wind meter	pc	10	130.00	1,300.00
d	Solar panels	pc	10	858.77	8,587.70
e	Data\ network box	pc	10	628.00	6,280.00
f	Concrete anchorage footings	pc	30	200.00	6,000.00
g	Concrete base plate for the tower	pc	10	300.00	3,000.00
h	Steel anchorage cables	pc	30	300.00	9,000.00
j	Fencing	meter	400	160.00	64,000.00
j	Gravel	m3	100	40.00	4,000.00
3	**Hydrological stations**				
a	Divers (brackish water type)	pc	34	1,826.80	62,111.20
b	Divers (fresh water type)	pc	60	1,658.00	99,480.00
c	Floating water level guage	pc	94	475.00	44,650.00
c	Perforated PVC tubing	pc	94	80.00	7,520.00
d	Galvanized bracing pipes	pc	282	250.00	70,500.00
e	Data\ network box	pc	60	628.00	37,680.00

f	Site level surveying	Spots	94	800.00	75,200.00
g	Solar panels	pc	60	858.77	51,526.20
4	**Inspection & testing**				
a	TAS inspection	week	4	300.00	1,200.00
b	Off-site test (pre install)	pc	104	100.00	10,400.00
c	Test site preparation	pc	1	500.00	500.00
d	Concrete anchorage footings	pc	3	200.00	600.00
e	Concrete base plate for the tower	pc	1	300.00	300.00
f	Steel anchorage cables	pc	3	300.00	900.00
g	Tower construction	pc	1	900.00	900.00
h	Perforated PVC tubing	pc	1	80.00	80.00
i	Galvanized bracing pipes	pc	3	250.00	750.00
j	Data\ network box	pc	2	628.00	1,256.00
	SUBTOTAL				658,247.50
5	**Provisional Sum**	PS	1	25,000.00	25,000.00
		TOTAL			683,247.50

Figure 18 Estimating costs of works (Source: MPW projects, 2018)

No.	Line item	Unit	A Amount	B Unit Price (USD)	A x B = C Total per item (USD)
1	**AMP**				
a	Base model	pc	1	180,000.00	170,000.00
b	Expansion packs	pc	1	10,000.00	10,000.00
c	Mobile acces converters	pc	3	5,000.00	15,000.00
d	Server Hardware	pc	1	8,000.00	8,000.00
e	Server Software upgrades	pc	2	20,000.00	40,000.00
f	Hydro Met data conversion software	pc	2	30,000.00	60,000.00
9	Software programming	hours	100	300.00	30,000.00
	Subtotal				333,000.00
	Provisional Sum	PS	1	30,000.00	30,000.00
		TOTAL			363,000.00

Figure 19 Estimating costs of AMP (Source: compiled by author)

The total estimated costs are summarized in the following table,

	Item	Estimated costs
1	Services	$ 451,660.00
2	Works	$ 683,247.50
3	Supplies	$ 363,000.00
	Total	**$ 1,497,907.50**

Which includes a total of USD 55,000.00 of reserves.

4.5.2 Monitoring Costs

The SCU will monitor costs using the Earned Value Method\ analysis. For each activity, a monitoring table will be used to log the action in time, quantities delivered, or executed. The SCU will compare these logs with the WBS, Schedule, and Cost Baseline, at the end of each month. The Actual Cost (AC) and Earned Value (EV) will be calculated from the logs.

4 N	PROJECT :					Periode nr. :					Rap.Nr.:
						roduced works, supplies, service			Costs		
No.	Line item	Unit	A Amount	B Unit Price (SRD)	C Total per item (SRD)	D Till this period	E In this period	F up untill this period	G Till this period (SRD)	H This period (SRD)	I Up untill this period (SRD)
1											
2											
3											
4											
5											
6											
7											
8											
	TOTAL				0.00				**0.00**	0.00	0.00
							Retention 5%		**0.00**		
							To invoice amount		**0.00**		

Figure 20 Standard form MPW (Source MPW, no date)

The form featured in figure 19, is the standard form the MPW uses on all projects, which logs the monthly progress of every project. This form will be used by the SCU to monitor the costs of the project.

From this form columns G, H, and I are essential to control if the project is on schedule. From the costs associated with the progress each month, the EV is derived, being column H. The contractor and supervisor should jointly sign off on this document. The approved form will be the basis for payment to the contractor, supplier, or service provider.

Monitoring can be done graphically, by the SCU if they use the time\ cost diagram which produces the S-curve for the project.

4.6 Stakeholder Management Plan

The AMP has stakeholders which are internal and external to the project, and for each group, the SCU will prepare the analysis on their influence and power on the project. For each group, a management plan will be developed. For stakeholder engagement, the Communication Management Plan (see Paragraph 4.7) will be used.

4.6.1 Internal Stakeholders

Internal stakeholders are the stakeholders, who have a direct influence on the contractual parts of the project. They include the SCU members, the Permanent Secretaries of MPW and Finance, the Worldbank team, consultants, and contractors.

Chart 11 List of Internal Stakeholders (Source: compiled by author)

Organization	Stake holder	Code for analysis figure 20
SCU	SCU Coordinator	SCUC
	SCU Deputy Coordinator	SCUDC
	SCU Financial Manager	SCUFM
	SCU Civil Engineer	SCUCE
	SCU HSE Specialist	HSE
	SCU S&C Specialist	SCS
	SCU Procurement Specialist	SCUPS
	SCU Assistant PS	SCUAPS
MPW	Permanent Secretary	PSMPW
	Minister of Public Works	MPW
MF	Minister of Finance	MF
	Permanent Secretary	PSMF
WB	Team Task Leader	TTL
	Procurement Manager	PM
	Financial Manager	FM
Contract Parties	Project Lead consultant	ENG
	Project Lead Contractor	CON

The analysis of these stakeholders will identify their relative power and influence on the project. For ease of reading the power versus influence graph, see figure 20 below, the specific abbreviations, listed in chart 11, have been used.

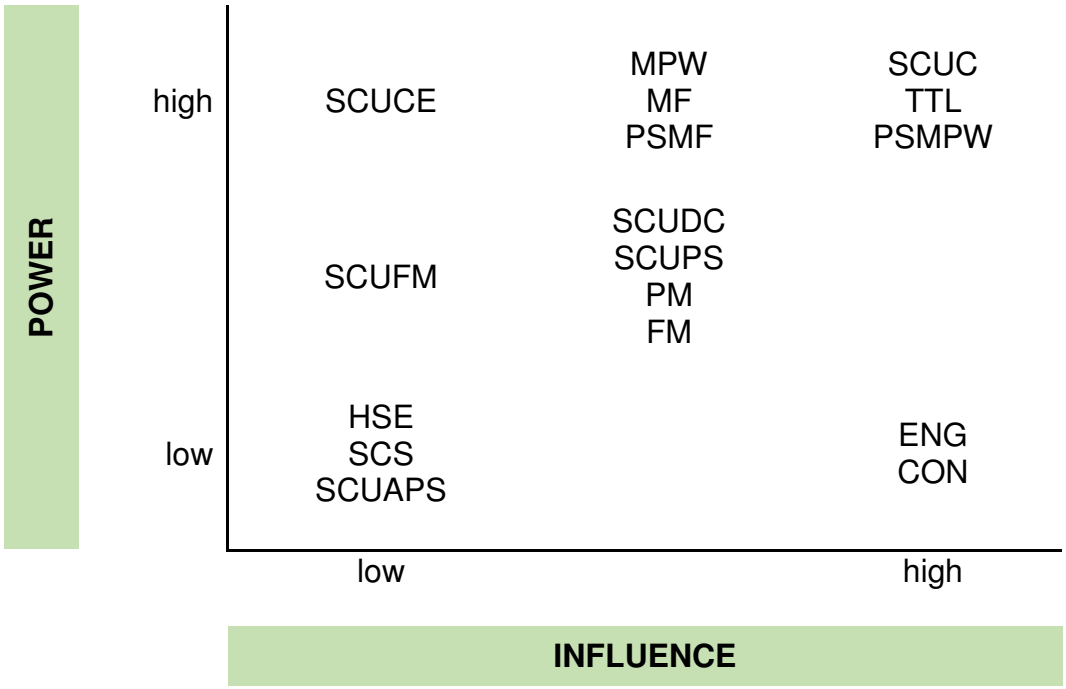

Figure 21 Graph Internal Stakeholders Power vs Influence analysis (Source: compiled by author)

To manage these internal stakeholders the SCU will have to implement the following.

Quadrant	Description
Low power\ Low Influence	These stakeholders will be monitored and informed on the project. Their concerns or advice will be considered and addressed.
Low Power \ High Influence	These stakeholders will also be monitored and will be provided with the correct information as needed.
High Power \ Low Influence	These stakeholders will be monitored, and their concerns and advice will be considered essential for the successful completion of the works.
High Power \ High Influence	These stakeholders have key roles within the project and should stay informed on the progress of the project and their concerns, advice, or comments will need to be addressed correctly and promptly.

4.6.2 External Stakeholders

The external stakeholders are the stakeholders, who do not have a direct influence on the contractual parts of the project. They are identified as a stakeholder because their involvement will be necessary during each project phase, being a source of information, the target general or special users or, providing feedback on the project deliverables. The list of external stakeholders is listed in chart no.12

Chart 12 List of External Stakeholders (Source: compiled by author)

Organization	Stake holder	Code for analysis figure 21
MPW	Head Meteorological Service	HMS
	Hydrology Department	WLA
	Drainage department	OWW
Governmental agencies	District representatives	DC
	Ministry of Regional development	MRD
	Ministry of Agriculture	LVV
	Ministry of Spatial Planning	ROM
	Environmental agency of Suriname (NIMOS)	NIMOS
	Disaster Relieve organization (NCCR)	NCCR
others	Local communities	LC
	Telecom company	Telesur
	Technical Staff Engineering firm	STEF
	University of Suriname	UVS
	Contractor Staff	CSt
	Met-Hydro equipment Supplier	Supplier
	Project Committee	SCU PC
End Users	General users	GU
	Local Engineering firms	EF
	Media companies	Pers
	Students	Stu

The analysis of these stakeholders will identify their relative interest and influence on the project. For ease of reading the interest versus influence graph, see figure 21 below, the specific abbreviations, listed in chart 12, have been used.

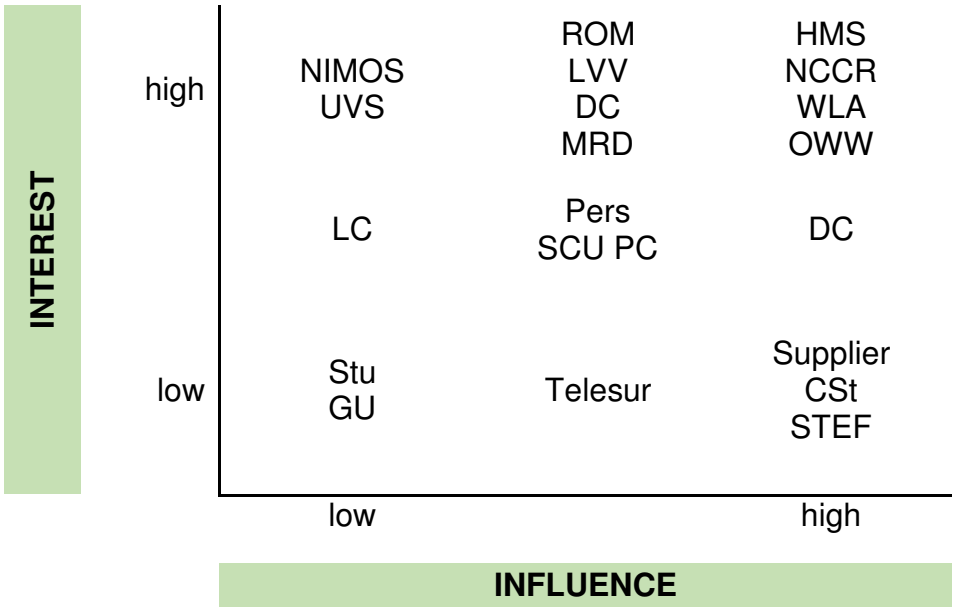

Figure 22 Graph External Stakeholders Interest vs Influence analysis (Source: compiled by author)

To manage these external stakeholders the SCU will have to implement the following.

Quadrant	Description
Low interest\ Low Influence	These stakeholders are informed of the project deliverables and their feedback will be considered and addressed.
Low interest \ High Influence	These stakeholders will be monitored and informed on the project. Their concerns or advice will be considered and addressed.
High interest \ Low Influence	These stakeholders will be monitored, and their concerns and advice will be considered essential for the successful completion of the works.
High interest \ High Influence	These stakeholders should be kept informed on the progress of the project and their input, concerns, advice, or comments must be addressed correctly and promptly.

4.7 Communication Management Plan

For this project the SCU will use various communication methods to cope with local legislation, World Bank regulations, and special restrictions due to Covid-19.

Local and World Bank regulations require some documents to be physical, whilst other documents can only exist virtual.

Documents that have to be physical (but can be submitted digitally) are:

1. Tender documents
2. Bid documents (especially the winning bid documents)
3. Contracts
4. Financial statements
5. Final delivery reports

(local legislation requires at least one (1) hardcopy)

4.7.1 Internal communication

Within the SCU the project team will use the following communication tools:

- Face to face meeting
- Email communication
- Telephone calls
- WhatsApp group chats and calls
- Virtual meetings via Zoom
- Reports

4.7.2 External communication

The SCU will use the following communication tools to communicate with external stakeholders:

- Face to face meetings
- Virtual meetings via Zoom or WebEx
- Telephone calls
- Emails
- Letters and reports
- Audiovisual aids, such as PowerPoint presentations, photos, videos, and demos
- WhatsApp chat only
- Communique's, such as press releases, and public announcements

Chart 13 Communication Matrix AMP project (source: compiled by author)

	DETAILS	RESPONSIBILITY	WHEN	MEDIA OF COMMUNICATION	WHOM TO INFORM	EVIDENCE OF COMMUNICATION
INTERNAL COMMUNICATION						
1	Progress meetings SCU	SCU coordinator	Montlhy	Face-to-face\ Zoom	all team members	Minutes of Meeting
2	Financial reporting	Financial Specialist	Montlhy	Written reports	all team members	Financial balalce closing out the month
3	Monthly Progress meeting	SCU coordinator	Montlhy	Face-to-face\ Zoom	All Senior SCU Staff	Monthly Progress report
4	Trainings	SCU dept Coordinator	Bi-annually	Zoom\Virtual class	All relevant SCU Staff Min. of Public Works Min. of Finance & Finance	Training Certificates
5	Ad-hoc meetings, themed	SCU dept Coordinator	On request	Face-to-face\ Zoom	Relevant SCU Staff	Minutes of Meeting\ To do list
EXTERNAL COMMUNICATION						
1	Project Progress meeting	Engineering Firm	Monthly	Zoom\ face-to-face	SCU members Consulting Firm Contractor Suppliers Min.of Public Works Min. of Finance & Finance	Monthly project reports, including technical and financial Progress
2	World Bank Meeting	SCU Coordinator	Bi- annually	Face-to-face \WebEx	SCU members Consulting Firm Contractor Suppliers Min.of Public Works Min. of Finance & Finance	Mission reports
3	Stakeholder engagements	SCU Social & Community Specialist	Quarterly	Virtual \ Face-to-face	SCU dep Coord comm. Representatives Press	reports of meetings \ to do list\ punchlist
4	Stakeholder engagements	SCU Social & Community Specialist	On request	Virtual \ Face-to-face	SCU dep Coord comm. Representatives Consulting Firms External Stakeholders (Chart no. 12)	Minutes of meetings Draft report + comments list
5	Health, Safety & Environmental Audit	HSE Manager	Annually	Virtual \ Face-to-face	SCU members Consulting Firm Contractor Suppliers	Reports of meetings \ to do list\ punchlist
6	Communiques	SCU Social & Community Specialist	Bi- annually	Via website MPW	General Public	Bulletin\ new letters

4.8 Procurement Management Plan

For the AMP project, the World Bank Procurement Regulations for IPF Borrowers will be leading for each procurement. The SCU is responsible for the project to adhere to these regulations.

The other procurement requirement from the World Bank is the digital administration of each procurement, through their web portal. This portal is called STEP (**S**ystematic **T**racking of **E**xchanges in **P**rocurement system), for which the procurement section of the SCU is responsible.

This system has a procurement plan template, which will be used for the AMP project.

STEP SYSTEMATIC TRACKING OF EXCHANGES IN PROCUREMENT

SARAMACCA CANAL SYSTEM REHABILITATION

v.02242016

Description (Value cannot exceed 250 Characters)	Reference No. (Value cannot exceed 40 Characters)	Procurement Category	Procurement Method	Estimated Amount (Must be greater than zero, and a positive number)	Bank Financed % (Can not be greater than 100%)	Review Type	Planned Start Date (Must be in YYYY/MM/DD format)
Component 2: Strengthening the Saramacca Canal Water Management System (US$3.0 million)							
Consulting Services for the Updating of norms and guidelines for drainage management		CS	QCBS I	1,100,000	100%	Prior	2019/06/01
Consulting Services for the Drainage infrastructure asset management platform and a flood forecasting system, including reinforcing hydromet data network		CS	QCBS I	1,200,000	100%	Prior	2019/09/01
Consulting Services for the feasibility study for the Institutional support toward a possible Saramacca Canal System Platform		CS	CQS N	200,000	100%	Post	2019/09/01
TOTAL COMPONENT 2				2,500,000			

Figure 23 Procurement Plan template (Source World Bank STEP, 2016)

For the AMP project, there will be 3 categories of procurements:

1. Consulting Services: The procurement of the consulting firm to create the specifications for the AMP and implement and adapt the AMP.

2. Works: The procurement of a contractor to erect and commission the additional Hydro- Met stations.

3. Goods: Procurement for the equipment of the Hydro-Met stations and the base model of the AMP.

The preferred procurement methods will be National Competitive Bidding and Shopping. The column Review type refers to WB procedures requiring review of bid documents, contracts before launch or signing or afterward.

STEP SYSTEMATIC TRACKING OF EXCHANGES IN PROCUREMENT

SARAMACCA CANAL SYSTEM REHABILITATION PROJECT

v.02242016

Description (Value cannot exceed 250 Characters)	Reference No. (Value cannot exceed 40 Characters)	Procurement Category	Procurement Method	Procurement Type	Estimated Amount (Must be greater than zero, and a positive number)	Bank Financed % (Can not be greater than 100%)	Review Type	Planned Start Date (Must be in YYYY/MM/DD format)
Component 2.3 : Asset Management Platform								
AMP consulting firm	SCSR\MPW\Cmp2-031	Consulting Services	NCB	QCBS	750,000	100%	Prior	2021/11/01
AMP Hydro Met station supply	SCSR\MPW\Cmp2-032	Goods	NCB	RFB	350,000	100%	Prior	2022/10/11
Supply of a Base model AMP	SCSR\MPW\Cmp2-033	Goods	Shopping	RFB	300,000	100%	Prior	2022/10/11
Workcontract for erecting and commissioning Hydro-Met Stations	SCSR\MPW\Cmp2-034	Works	NCB	RFP	100,000	100%	Post	2023/02/09
TOTAL COMPONENT 2.3					1,500,000			

Figure 24 Procurement Plan AMP (source: compiled by author)

The types of procurement methods are Request for Bids (RFB) for the goods, Request for Proposal (RFP) for the works, and Quality Cost Based Selection (QCBS) for the consulting services.

4.9 Quality Management Plan

The Deliverables for the AMP are:

1. The contract with a consulting firm
2. The additional Hydor Met stations
3. The base AMP
4. Historical Hydro-Met data analysis
5. New Hydro-Met Stations
6. The online version of the AMP

For each deliverable, a set of quality requirements and quality control measures will be created by the SCU. The quality management plan will follow the Plan, Do, Check, Act principle to ensure project deliverables.

In the following Chart 14, the quality requirements of each main deliverable are addressed with the specific actions to be taken by which party.

For the permission on the available frequency, for which data transfer from Hydro-Met stations to the MPW will be possible, a permit is needed. The MPW will apply for the permit. The independent check if the allocated frequency and bandwidth is adhered to is done by the Telecommunication Authority of Suriname (TAS).

Chart 14 Quality Management Plan AMP (Source: compiled by author)

WBS	Deliverable	Activity	Quality Requirements	Quality Control	Quality Assurance	Quality Improvement
			Plan	Do	Check	Act
1.1	Consulting firm Contract	Procurement documents	The firm has the experience of a minimum of 2 similar projects.	Procurement Specialist to complete all documents.	WB no-objection.	Correct what is required for no-objection.
			The contract value is within the allocated budget. The firm has proof of completed projects within the allowed time.		Bid evaluators to verify submitted documents comply to requirements.	
		Contract	To comply with WB regulations.		Legal opinion of the legal department of MPW will do a final screening.	

1.2	Additional Hydro-Met stations	Selection of station type.	Compatible with existing stations Durability > 10 years Remote data access Instruments working range.	Factory production certifiactes required.	Validate certificates with requirements.	Adjust requirements
		Procurement documents	The company is accustomed to working in tropical climate countries on at least 2 projects within the last 5 years.	Procurement Specialist to complete all documents.	Bid evaluators to verify submitted documents comply to requirements.	Correct what is required for no-objection.
			The company has proof of knowledge of installing hydro-Met Stations within the past 5 years.		WB no-objection.	
		Contract	To comply with WB regulations.		Legal opinion of the legal department of MPW will do a final screening.	

1.3	Base AMP	Selection of AMP base model.	Applicable for low lying \ flat areas. Open source application. Possible to update min. 10 years. Mobile phone accessibility.	Consulting firm provides proof of AMP requirements to the SCU.	Expert judgement and opinions.	Adjust base model requirements.
		Hardware for installation.	Durability > 10 years backup system.			Adjust requirements with approval from MPW.
1.4	Analysis historic data	Collect Hydro-Met Data.	Categorize data. Create database. Collect > 30 years of data.	Key experts of the consulting firm will collect and prepare the database.	Consulting firm will provide the detailed reports on the status and quality of the works.	Accelerate progress to meet deadlines.
		Adapt Historic data.	Convert to AMP requirements	Conversion program within AMP will convert the data.	Test runs AMP should provide proof.	Correct conversion to properly run AMP.

1.5	New Hydro-Met stations	On Site works	ESMP for each site PPE for personnel Equipment complies with legislation Test reports\ certificates for building materials	Contractor is required to follow the ESMP, tender document technical specifications	Inspection reports on ESMP Independent laboratory testing materials if needed.	Replace defective\ inferior materials or equipment Deduct penalties from payment.
			Hydro-Met stations should be placed within a 10m radius from the defined locations.	SCU Senior Civil Engineer to validate location.	Consulting firm will verify if location targets are met.	Search for other suitable location within the 10 m radius.
		Hydro-Met equipment testing	Factory quality certificates.	SCU will perform tests of site to ensure. equipment is of the standards required.	Consulting firm will verify quality of supplies.	Replace defective\ inferior equipment and materials.
			Water levels measured should be within a 1 cm accuracy.			
			Rainfall data measured should be within a 1 mm accuracy.			
		Data transfer	Network quality.	Compatible with bandwidth allocated by the TAS.	Independent inspection report from the TAS.	Replace defective\ inferior equipment Deduct penalties from payment if
			Redundancy to prevent data loss.	SCU will perform tests of site to	Test reports consulting firm.	

				ensure equipment is of the standards required.		project will be delayed.
1.6	Online AMP	Real-time flood maps.	Flood depth accuracy <10 cm intervals. Flooding area accuracy prediction between 85 -100%.	AMP software should be verrified by consulting firm.	Test floodmaps verrification.	Adjust requirements with approval from MPW.
		On site verrification reports.	Accuracy of area floodmaps >85%.	Consulting firm with SCU should do random site visits to verrify results.	Test floodmaps verification by SCU and key Stakeholders.	Adjust requirements with approval from MPW.
		AMP Online	Acces via Apple and Android mobile devices. Windows \ Mac compatibility. User-friendly interface.	AMP software should be verrified by consulting firm.	Test-subjects will provide feedback.	Supply additional software to adhere to requirements.

4.10 Risk Management Plan

For each of the deliverables of the AMP, the risks will be assessed and the management plan will be developed to mitigate or deal with the risk.

The risks are categorized into types such as financial, time, environmental, technical, and social.

4.10.1 Risk Breakdown Structure

Chart 15 Overview Risk Break Down Structure (Source: compiled by author)

RBS Level 0	RBS Level 1	RBS Level 2	RBS Level 3
Sources of risk	1. Financial Risk	1.1 The overall risk to achieving the Deliverables	
		1.2 Fiduciary risk	1.2.1 Procurement
			1.2.2 Missing contract signature
			1.2.3 Missing payments
		1.3 Cost overrun	
	2. Time Risks	2.1 Supply Hydro Met stations not on time	
		2.2 Contract time not adhered to.	

		2.3 Delivery not within allowed WB Loan agreement period.	
	3. Environ-mental Risk	3.1 Impact in urban areas	
		3.2 Lack of guidelines in mitigation actions.	
		3.3 Lack of guidelines and plans.	3.3.1 Environmental and Social Impact Assessment.
			3.3.2 Environmental and Social Management Plan.
		3.4 Weather.	3.4.1 No flooding event to calibrate AMP.
	4. Technic al Risk	4.1 Technical specifications AMP.	
		4.2 AMP not suited for mobile access.	
		4.3. Calibration AMP real-time data.	4.3.1 Accuracy below 85%.
			4.3.2 Lag in information processing.
		4.4 Design Hydro- Met Stations.	4.4.1 Existing Hydro-Met data not usable.

			4.4.2 replacing old stations required.
	5. Social Risks	5.1 Low interest Stakehloders.	
		5.2 Change in staffing SCU.	

4.10.2 Probability and Risk Scales

For categories, Financial, Environmental, Technical, and Social risk, the probability and, the scale will be defined for the AMP. Integrally all risks have either a time, cost, or scope impact, therefore there will be no separate table for the time risks.

The following scales are specific for the AMP project, with reference to the execution time and budget for the project. The scale has 6 levels from very high to null. For the entire project the null does not occur.

Financial Risks

Scale		+/- Impact on project objectives		
		Time	Cost	Quality
Very high	>75%	> 1 year	All the budget	Very significant in the project: for example procurement Consulting firm not successful.
High	56-75%	>6 months	30% of the budget	High impact on the quality.
Medium	36-55%	3 to 6 months	< 5% of the budget	Relative impact in the quality can be resolved.
Low	16-35%	1 to 2 months	<1% of the budget	Low impact.
Very Low	0-15%	< 1 month	< $20 000	Minor impact in the quality.
Null	0%	No change	No change	No change in the project.

Environmental Risks

Scale		+/- Impact on project objectives		
		Time	Cost	Quality
Very high	>85%	> 1 year	Additional costs	It could impact the project drastically if the weather affects the constructions.
High	60-85%	>9 months	% of the budget	High environmental and social impact.
Medium	40-60%	3 to 6 months	< 5% of the budget	It could affect urban population (relative impact in the quality, can be resolved).
Low	20-40%	1 to 3 months	<1% of the budget	Low impact (Policy related to mitigation).
Very Low	0-15%	< 1 month	< 1% of the budget	Minor impact in the quality
Null	0%	No change	No change	No change in the project

Technical Risks

Scale		+/- Impact on project objectives		
		Time	Cost	Examples
Very high	>70%	> 9 months	50% of the budget	AMP base model selection not correct.
High	40-70%	>6 months	30% of the budget	Access to site new Hydro-Met Stations.
Medium	30-40%	3 to 6 months	< 20% of the budget	Example Design process AMP.
Low	20-30%	1 to 2 months	<5% of the budget	Web application not functioning.
Very Low	0-20%	< 2 month	< 1% of the budget	Other equipment & data aquisition.
Null	0%	No change	No change	No change in the project

Social Risks

Scale		+/- Impact on project objectives		
		Time	Cost	Examples
Very high	>70%	> 9 months	50% of the budget	AMP base model selection not correct.
High	40-70%	>6 months	30% of the budget	Access to site new Hydro-Met Stations.
Medium	30-40%	3 to 6 months	< 20% of the budget	Example Design process AMP.
Low	20-30%	1 to 2 months	<5% of the budget	Web application not functioning.
Very Low	0-20%	< 2 month	< 1% of the budget	Other equipment & data acquisition.
Null	0%	No change	No change	No change in the project.

Probability Scales

Scale	Very High	High	Medium	Low	Very Low	Null
	> 65%	64-35%	34 – 25%	24-10%	< 9%	0%

4.10.3 Risk Register

Chart 16 Risk register for the AMP Project (Source: compiled by Author)

RBS CODE	RISK	OWNER OF THE RISK	CAUSE/ REASON	TRIGGER	CONSEQUENCE/ EFFECT	PROBABILITY	IMPACT	LEVEL OF RISK	RISK RESPONSE STRATEGY	COST
1.1	The overall risk to achieving the Deliverables	PM	Other projects within the portfolio of MPW or not finished when the AMP project starts	Arial Mapping and surveying not finished by July 2022.	Project delay.	Low	High	Very High	SCU should colaborate with other PM to ensure proper planning. PS MPW should be notified as soon as possible on the effects.	$ 1,500,000.00
1.2.1	Procurement	PS	Failure to hire firms, contractors and suppliers.	Procurement unsuccesful at first go.	Delay. Cancellation of project.	Medium	High	High	SCU will ensure interested parties will be given enough time and information to submit a compliant bid.	$ 1,300,000.00
1.2.2	Missing Contract signature	PS	Hardcopy of contracts not signed.	Oversight	Final delivery documents can not be completed.	High	Very Low	Low	PS assure and follow-up on administrative procedures for the contacts.	$ -
1.2.3	Missing Payments	FM	Invoices not processed or paid.	Oversight	Delay in execution	Medium	low	medium	Registry of documents and monitoring.	Up to 10% contract value
1.3	Cost overrun	PM	Insufficient management reserve within project cost determination.	Price escalations\ New tax legislation.	Cancellation of some project deliveries.	Medium	High	medium	Request more funding for project through MPW. Request for scope adjustments.	if more than $200,000.00
2.1	Supply Hydro-Met stations not on time.	DPM	Acquiring, shipping and logistics causing delays	Specialized equipment not easily available.	Project delay.	Medium	Very High	High	Better define equipment, doing market research.	$ 650,000.00
2.2	Contract time not adhered to.	PS\ DPM	Contracting parties not meeting deadlines.	project running more then 30% behind schedule.	Termination of contracts project delays > 50%.	Low	Very High	Medium	monitoring of progress, adjusting and or accelarating activities by parties.	$ 500,000.00
2.3	Delivery not within allowed WB Loan agreement period	PM	Entire project behind on schedule.	Project running more then 50% behind schedule.	Cancellation of project by WB.	Low	Very High	Medium	Request MPW to apply for loan extension Cancel project, limiting claims and costs.	$ 750,000.00
3.1	Impact in urban areas	SCE	Stations causing hinder to urban residents.	Complaints	Imposed pause by MPW\WB to address issues.	Very Low	Very Low	Very Low	Register, monitor and adress complaints. ESIA, ESMP should be reviewed by NIMOS.	Up to $5,000.00 penalty per incident
3.2	Lack of guidelines in mitigation actions.	HSE	Grievance mechanism not working.	Complaints		Low	Low	Low		
3.3.1	Environmental and Social Impact Assesment	HSE	Grievance mechanism not working.	Complaints		Low	Low	Low		
3.3.2	Environmental and Social Management Plan	SCG	Grievance mechanism not working.	Complaints		Low	Low	Low		
3.4.1	No Flooding event to calibrate AMP.	SCE	Flooding events do not occur during testing phase.	Prolonged dry weather during contract (testing) phase	Calibration of the prediction accuracy will be low. Project Goal not being reached.	Medium	Very High	High	Request for extension of time by MPW to the WB, enabling test during next rainy season.	Up to $ 100,000.00 on consulting & Impl support fees
4.1	Technincal Specifications AMP.	SCE \ DPM	Suited base model AMP not readily available.	Various model analysis not done diligently	Project delay. project goal not reached.	Low	Very High	Low	Ensure various options AMP base models are studied. Ask WB to use their network to indentify possible other suppliers.	$ 300,000.00
4.2	AMP not suited for Mobile Access.	SCE	Licenses preventing all platforms acces.	Various model analysis not done diligently	Project delay. project goal not reached.	Low	Medium	Low	Search for emulating software. Adjust Project deliverables after WB\ MPW approval.	$ 50,000.00
4.3.1	Accuracy below 85%	Consultant	Calibration of real flooding events unsatisfactory.	Insufficient data collection	Project goal not reached.	Medium	Very High	High	SCU should request cancelation of project. Adjust project deliveries.	$ 300,000.00
4.3.2	Lag in information processing	Consultant	Data not reaching Network server on time.	AMP not functioning correctly.	Accuracy below 85%	Medium	High	Medium	Test equipment. Verify specs of supplied equipment and hardware.	$ 60,000.00
4.4.1	Existing Hydro Met data not usable.	MPW	Stations not suited for data gathering for AMP.	Analysis report	Not enough new stations; project goals not reached.	Low	High	High	SCU should request adjustment of project scope\ deliverables.	$ 600,000.00
4.4.2	Replacing old stations required.	PM \ MPW	No new stations can be installed.	Analysis report		Medium	High	Medium		$ 300,000.00
5.1	Low interest Stakeholders	SCG	Other projects gain more attention and are causing low attendence\ response.	Participation; feedback low	Input, comments, will be insufficient.	Medium	Low	Medium	SCG will use the communication plan to ensure more participation. Keep session interactive.	Costs of organizing various meetings up to $ 20,000.00
5.2	Change in staffing SCU	MPW	Change in management MPW	Government change due to public turmoil.	Project delay.	Low	High	Medium	MPW will have to bear consequences.	$ 300,000.00

4.10.4 Risk control & Monitoring

From the risk register it can be derived that there is only one risk, which has a high probability, but a very low impact. Because some project documents are to be submitted in hardcopy and most in softcopy, missing a few signatures could be something that happens a lot. The SCU FM should manage this process and mitigate the risk easily.

The project has to finish before the World Bank loan agreement expires by December 31st, 2021. All identified risks with a time consequence have a high to very high impact on the project. The SCU should monitor and address variances from the schedule effectively. Parties should be given the instructions to accelerate when is required.

CONCLUSIONS

The Asset Management Platform (AMP), which will be a valuable tool for the Ministry of Public Works (MPW), Suriname, to manage and monitor the stormwater drainage and sewerage system efficiently. The implementation of the AMP will be in the form of a project, which is a part of the Saramacca Canal System Rehabilitation Program. To manage this project a project management office is established, named the Saramacca Canal Unit (SCU), which is responsible to achieve the project goals. According to the guidelines for the definition of a project, the Project Management Institute (PMI) requires a project to have a project management plan.

1. The developed Project management plan, for this Graduation project, includes all the ten (10) knowledge areas and can assist the SCU in the implementation of the project, and achieving the project deliverables and objectives.

2. The integration plan includes the project charter, which is the main document the employer (MPW) has to sign off on. This document mandates the SCU to implement the project and defines the six (6) objectives of the project.

3. The scope management plan lists the 33 work packages, which the SCU needs to execute to complete the AMP. The WBS places these activities into the 6 project deliverables. These 6 deliverables are the contract with the Consulting Firm, the works contract with a Contractor, the Base AMP model, the conversion of historical Hydrology and Meteorological (hydro-met) data, the installation of new hydro-met stations, and the online version of the AMP.

4. The execution of this project will start on November 1st, 2021, and will last till April 1st, 2024, and is within the allowed World Bank (WB) loan agreement

timeframe. The loan agreement lasts till December 31st, 2024. The most critical activities within the scope of this project, are the successful hiring of the consulting firm and the works to be completed for the installation of the new hydro-met stations. Failure to complete these activities could result in the cancelation of the entire project.

5. The resources needed to achieve the AMP are mostly external to the PMO and the organization. The SCU must follow the WB procurement procedures to contract the consulting firm, suppliers, and a works contractor. Procurement should also be administered in the WB online web portal.

6. The key stakeholders for the AMP are divided into two categories namely stakeholders with power and influence and stakeholders with interest and influence. The stakeholders from both these categories, who are in the high\high sector of the stakeholder analysis will need to be kept informed and their concerns or comments should be addressed by the SCU.

7. The risk management plan identifies 21 risks for the project of which two of low probability, carry the risk of project cancellation by the Worldbank. If the procedure of contracting the consulting firm, is not successful when tendered the first time, the project should be canceled, because the WB loan agreement period will not be met.

8. The project costs can be highly influenced by the analysis of the hydro-met data of existing stations and the availability of the base AMP model which could be adapted to be applied for the situation in Paramaribo. If both of these analysis turn out negatively the project deliverables will not be met.

RECOMMENDATIONS

1. The MPW should have a department within its organizational structure that is dedicated to project management. This department should be able to provide the various projects with a qualified and full-time project manager.

2. The SCU can use the developed plans as a basis to implement the AMP project, but because of the available time remaining on the loan agreement, they should start up negotiations with the Ministry of Finance & Planning and the World Bank if an extension of time on the loan agreement will be considered.

3. Irrespective of the results of the analysis of the existing hydro-met stations, the MPW should consider updating the stations, wherein using telecommunication technology can benefit other areas which are not yet considered in this AMP. The real-time data feature of these systems could aid residents and warn of potential flooding.

4. The MPW should consider doing similar projects in other parts of the country to better manage and monitor the stormwater drainage system. The online part of the AMP provides residents and other users access to valuable information to be prepared for possible flooding.

5. The internal training of the SCU should also be available for some personnel of the MPW, to enable knowledge transfer and better prepare the MPW for other WB financed projects.

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APPENDICES

Appendix 1: FGP Charter

PROJECT CHARTER	
Date:	**Project Name:**
May, 12th 2021	The Project Mangement plan for the Asset Management Platform project
Knowledge Areas / PM Processes:	**Application Area (Sector / Activity):**
Knowledge Areas: Integration Management Scope Management Time Management Cost Management Quality Management Human Resources Management Communicatios Management Risk Management Procurement Management Stakeholder Management PM Processes:	Infrastructure / online platform creation
Initiation	
Planning	
Project Start Date:	**Project Finish date:**
May, 12th 2021	November, 30th 2021

Project Objectives (General and Specific):

General Objective:

To develop a project management plan for the Project of creating an asset management Platform for the Saramacca Canal System, to enable efficient usage of the drainage system.

Specific Objectives:

1. To develop the Project Charter for the project, in order to define the project objectives.
2. To develop a Scope Management Plan, which defines the work needed to be done to achieve the deliverables of the project.
3. To develop a Schedule Management Plan, which determines the project duration.
4. To develop a Stakeholder Management Plan, to help the project team to identify and manage stakeholder engagement.
5. To develop a Resource Management Plan for the AMP, which will access which resources are available internally or externally to execute the project.
6. To develop the Procurement Management Plan for the scope of the project, which will describe the method and processes needed to access and contract external resources and supplies.
7. To develop the Quality Management Plan, which will set the quality parameters and the procedures to control the quality of the project.
8. To develop a communication management plan for the stakeholders, which will define the strategy for internal en external communication.
9. To develop a Risk Management Plan for the project, which will identify procedures to enable the team to manage the risk for the project.
10. To develop a cost estimate for the project, to calculate the project cost and procedure to evaluate the earned value of the project.

Project purpose or justification (merit and expected results):

The Ministry of Public Works is responsible for the storm water management for the district of Paramaribo. Within the stormwater system of canals and culverts, the Saramacca Canal is the most essential drainage infrastructure, as it influences nearly 40% of the area of the district. Till now information about flooding is not readily available and information is scattered. The general public has to get information from several sources and piece it together themselves. To ensure the data and the representation of it is correct this project will combine existing mapping, with rainfall data as well as stormwater flow data, retrieved from canals, sluices and pumping stations, to accuratly predict flooding events from rainfall. For the general public it can

help them prepare better in case of heavy rains and for the government the database will help plan resources and funding toward improvemens in flooding prone areas.

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

The FGP deliverables will be the project charter, the defenition of the Scope, schedule and resources plan needed to execute the project. Additional deliverables will be a communication plan, analysis an a register of the stakeholders, the procurement plan and a cost estimate and the risk assessment plan.

Assumptions:

It is assumed that the complete mapping of the area will be concluded in another sub project, which is being executed within the Saramacca Canal System Rehabilitation Project. All data can be made compatible for easy usage and with simple interface. it is also assumed that all stakeholders will particiapte in obtaining their preferences in a timely manner.

Constraints:

A limiting factor for web based applications is the available internet speed in Suriname and the cost of internet data to transfer information from mobile hydrology stations. All available data from other projects will need to be adapted to suite the online platform.

Preliminary Risks:

If the key stakeholder participation in this stage is not optimal, it will impact the quality and the scope of the project deliverables.
The scope and deliverables should be withing the allocated budget within the loan of the World Bank.

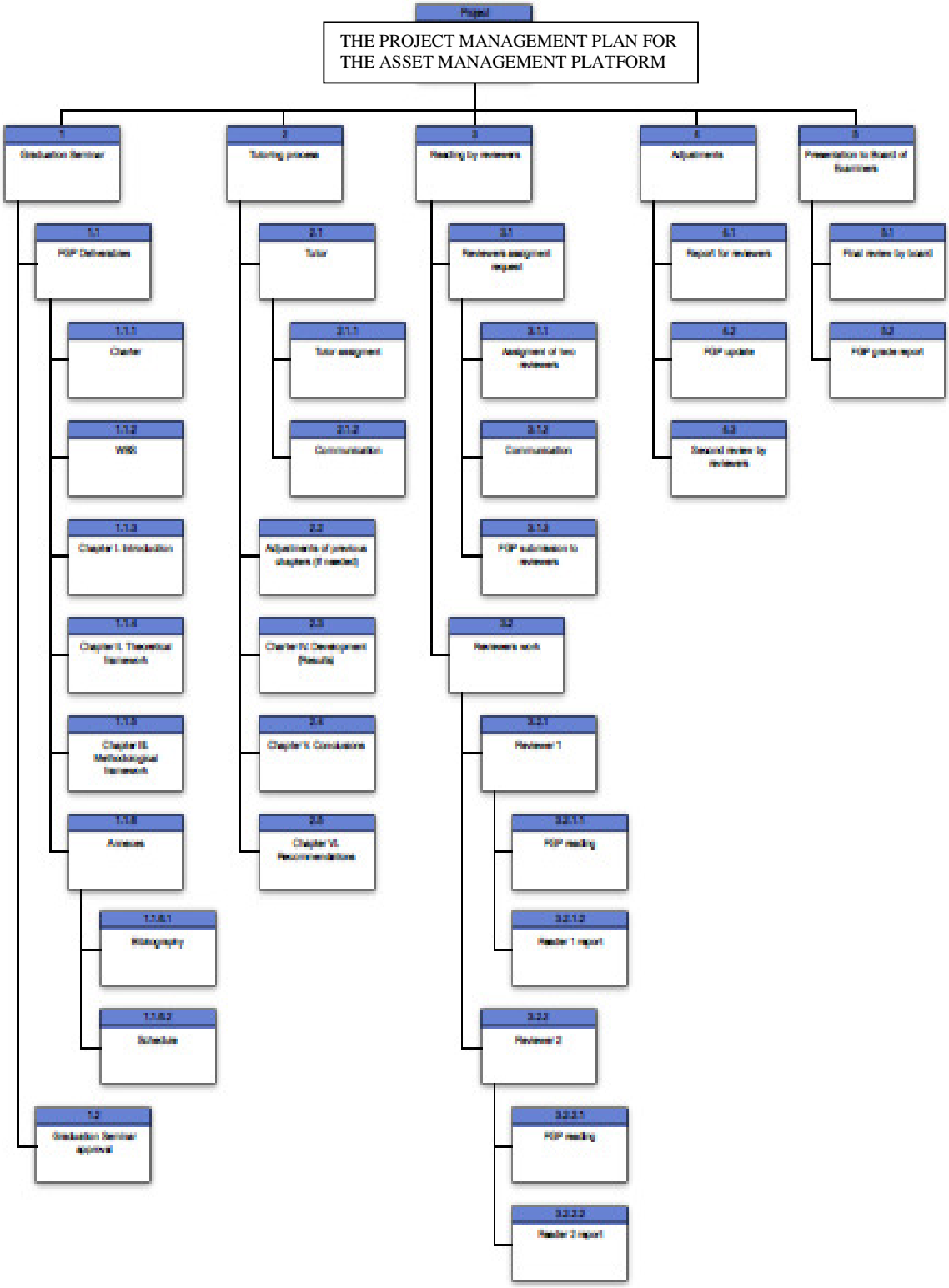
Budget:

The Budget for the FGP, which will be executed by one (1) person will amount to :
17 weeks x 70 hours à SRD 50/ hour = SRD 59,500.00
8 weeks x 10 hours à SRD 50/hour = SRD 4,000.00
Totaling to SRD 63,500.00 ≈ US $ 3,175.00

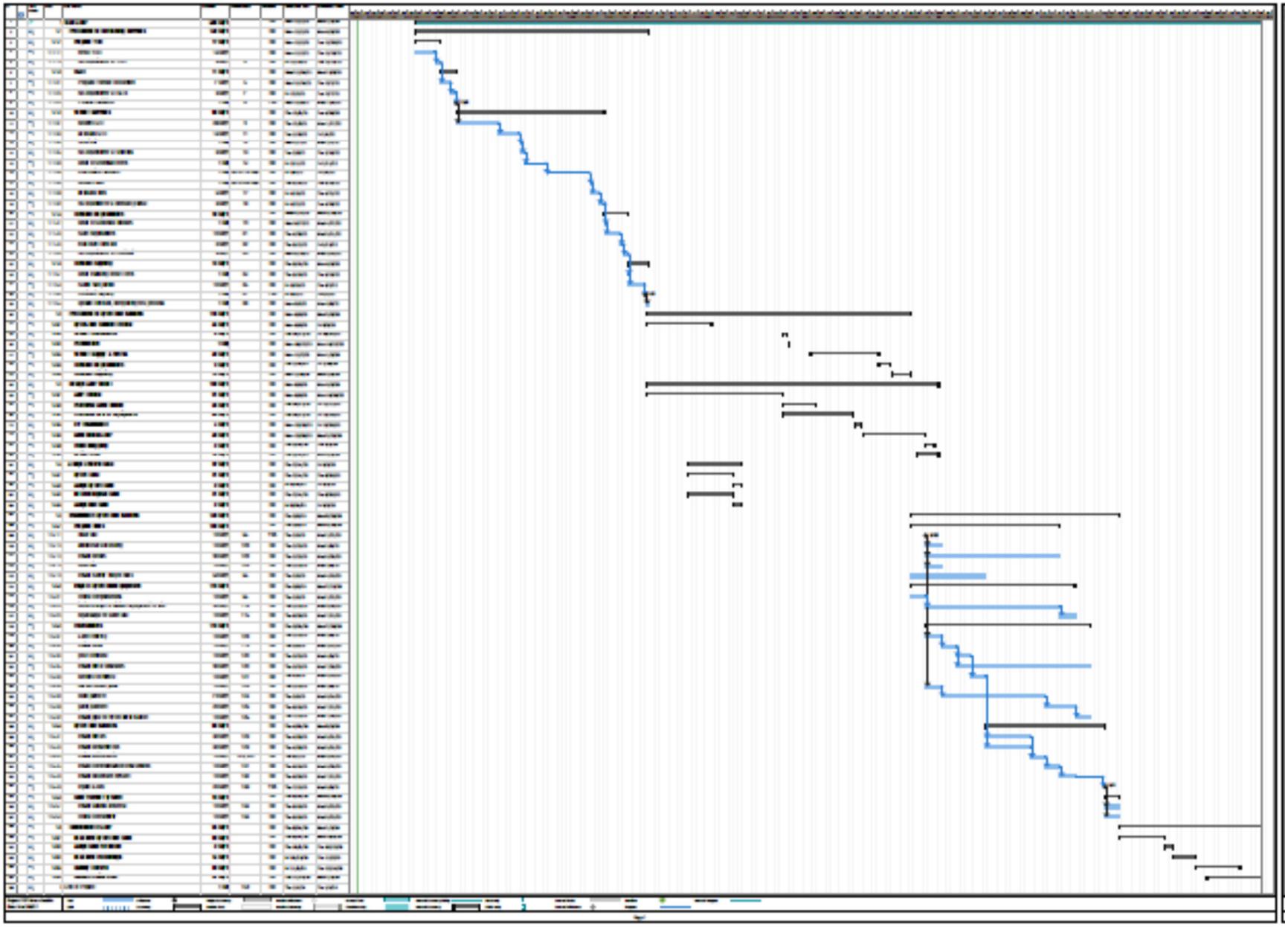
Milestones and dates:		
Milestone	**Start date**	**End date**
Project Charter	May 12th 2021	May 16th 2021
FGP WBS	May 15th 2021	May 16th 2021
Introduction Chapter\ FGS Schedule	May 18th 2021	May 23rd 2021
Theoretical Framework Chapter	May 25th 2021	May 30th 2021
Methodological Framework Chapter	June 1st 2021	June 6th 2021
Abstract / Executive Summary	June 8th 2021	June 13th 2021
Chapter 3 / 6	June 15th 2021	October 31st 2021
Tutor Review	November 1st 2021	November 16th 2021
Final submission	November 30th 2021	November 30 th 2021

Relevant historical information:	
The Ministry of Public Works is the department of the Government responsible for urban drainage in nearly all of the Republic of Suriname. From this responsibility discussions were started in 2014 with the World Bank to finance projects aiming to reduce disaster risks. From the following analysis, done by independent engineering firms contracted through the World Bank, the Saramacca canal System was selected as being the most vulnerable infrastructure within the system of stormwater management. Furthermore, the information availability of indentifiying flood areas and flood hazard areas are not well known to outsiders. To better inform the public and other relevant stakeholders the Ministry has decided to allow access to data regarding this matter. Through the use of a online platform different stakeholders will be able to get different levels of data to inform or use for other studies. Within the Ministry of Public Works there has not been any sustainable web data portals till now and this project will be the first on such a scale.	
Stakeholders:	
Key stakeholders: Ministry of Public Works: Drainage Department, Meteorological Department, Hydrology Department Other stakeholders: Shipping companies, commercial users along the canal, representatives of local communities, and other line ministries.	
Approval:	
Project Manager: Satish Mohan	Signature: 
Authorized by:	Signature:

Appendix 2: FGP WBS


THE PROJECT MANAGEMENT PLAN FOR
THE ASSET MANAGEMENT PLATFORM

Appendix 3: FGP Schedule



Appendix 4: WBS Dictionary

For the level 1 deliverable the following WBS Dictionary was made:

No.	Item	Description		
1	WBS Code	1.1 : Procurement for consulting services		
2	Responsible Organization/ Individual	SCU : procurement Specialist		
3	Description	Contracting a competant firm to execute the project		
4	Deliverables	Service contract		
5	Acceptance Criteria	The consultant should have validated experience and their price offer has to be within the allocated budget.		
6	Budget	USD 950,000.00		
7	Milestones	Start: November 1st, 2021 contract signed : June 30th 2022		
8	Risks	Unsuccesfull bidding process Extension of bidding process due to unforseen circumstances.		
9	Additional Information	procurement guidelines of the WB are to be adhered to		
10	Approvals:	SCU director	Date:	Rev:

No.	Item	Description
1	WBS Code	1.1.1 :Prepare Terms of Reference
2	Responsible Organization/ Individual	SCU : Senior civil engineering consultant
3	Description	Writing down the project deliverables and services which the consulting firm will need to execute
4	Deliverables	A accepted ToR for the AMP
5	Acceptance Criteria	The Sponsor and the WB agree on the TOR
6	Budget	n.a. (integral part of SCU operations)

7	Milestones	Start : 01 November 2021 WB : no-objection: January 15th, 2022		
8	Risks	Other projects within the SCSRP not finished on time to integrate results in the TOR		
9	Additional Information	Upgrading Norms and guidelines project should be in execution		
10	Approvals:	PS MPW	Date:	Rev:

No.	Item	Description		
1	WBS Code	1.1.2 :launch REOI for tender		
2	Responsible Organization/ Individual	SCU : Procurement Specialist		
3	Description	Publishing advertisement locally and international via WB website portal		
4	Deliverables	Publication		
5	Acceptance Criteria	The Sponsor and the WB agree time table for launch project		
6	Budget	USD 100.00		
7	Milestones	Start : February 1st, 2022 end: February 22nd, 2022		
8	Risks	none		
9	Additional Information	Procurement guidelines WB		
10	Approvals:	PS MPW	Date:	Rev:

No.	Item	Description
1	WBS Code	1.1.3 :Tender for services
2	Responsible Organization/ Individual	SCU : Procurement Specialist
3	Description	completing the required procedures during the tender phase of the project

4	Deliverables	Received EOI's Evaluation of EOI and recommendated shortlist Letters to shortlisted firms with tender documents incl. ToR. Minutes of meeting of information session, clarifications and or amendments. MoM Opening session tender date		
5	Acceptance Criteria	no-objection from Sponsor and WB		
6	Budget	n.a. (integral part of SCU operations)		
7	Milestones	Start : February 22nd, 2022 Tender documents to shortlisted firms: April 1st, 2022 end: May 30th, 2022		
8	Risks	not enough competant EOI received Time delays		
9	Additional Information	Procurement guidelines WB		
10	Approvals:	SCU Director	Date:	Rev:

No.	Item	Description
1	WBS Code	1.1.4 : Contract negotiations
2	Responsible Organization/ Individual	SCU : Procurement Specialist
3	Description	Evaluation of the received bids
4	Deliverables	Technical evaluation report combined Technical and Financial report negotiated contract no-objection for signing of contract
5	Acceptance Criteria	no-objection from WB
6	Budget	n.a. (integral part of SCU operations)
7	Milestones	Start : June 1st, 2022 Stand still period: June 20 th, 2022 end: July 1st, 2022
8	Risks	Bids not within allocated budget Non of the firms qualified technically Time delays

9	Additional Information	Procurement guidelines WB		
10	Approvals:	SCU director	Date:	Rev:

No.	Item	Description		
1	WBS Code	1.1.5 : Contract signing		
2	Responsible Organization/ Individual	SCU : Procurement Specialist		
3	Description	Formality of sginig the contract by both parties		
4	Deliverables	A signed and agreed contract document		
5	Acceptance Criteria	Parties have their power of attorny to sign		
6	Budget	n.a. (integral part of SCU operations)		
7	Milestones	start\end: July 2nd, 2022		
8	Risks	PoA not acceptable Physical signing not possible		
9	Additional Information	none		
10	Approvals:	PS MPW	Date:	Rev:

Appendix 5: Activity List

FGP time schedule

ID	Task Mode	WBS	Task Name	Duration	Predecessors	Milestone	Scheduled Start	Scheduled Finish	Resource Names
1		1	**Start AMP**	**483 days**		**No**	**Mon 11/1/21**	**Wed 9/6/23**	
2		1.1	**Procurement Consulting Services**	**114 days**		**No**	**Mon 11/1/21**	**Thu 4/7/22**	
3		1.1.1	**Prepare TOR**	**17 days**		**No**	**Mon 11/1/21**	**Tue 11/23/21**	
4		1.1.1.1	Write TOR	14 days		No	Mon 11/1/21	Thu 11/18/21	
5		1.1.1.2	No-objection WB TOR	3 days	4	No	Fri 11/19/21	Tue 11/23/21	
6		1.1.2	**REOI**	**11 days**		**No**	**Wed 11/24/21**	**Wed 12/8/21**	
7		1.1.2.1	Prepare Tender Document	7 days	5	No	Wed 11/24/21	Thu 12/2/21	
8		1.1.2.2	No-objection WB REOI	3 days	7	No	Fri 12/3/21	Tue 12/7/21	
9		1.1.2.3	Publish invitation	1 day	8	Yes	Wed 12/8/21	Wed 12/8/21	
10		1.1.3	**Tender Services**	**57 days**		**No**	**Thu 12/9/21**	**Fri 2/25/22**	
11		1.1.3.1	receive EOI	28 days	9	No	Thu 12/9/21	Mon 1/17/22	
12		1.1.3.2	Evaluate EOI	14 days	11	No	Tue 1/18/22	Fri 2/4/22	
13		1.1.3.3	Short list	1 day	12	No	Mon 2/7/22	Mon 2/7/22	
14		1.1.3.4	No-objection WB Shortlist	3 days	13	No	Tue 2/8/22	Thu 2/10/22	
15		1.1.3.5	letter to shorlisted firms	1 day	14	No	Fri 2/11/22	Fri 2/11/22	
16		1.1.3.6	information session	1 day	15	No	Mon 2/14/22	Mon 2/14/22	
17		1.1.3.7	receive bids	1 day	16	No	Tue 2/15/22	Tue 2/15/22	
18		1.1.3.8	evaluate bids	5 days	17	No	Wed 2/16/22	Tue 2/22/22	
19		1.1.3.9	no-objection WB contract phase	3 days	18	No	Wed 2/23/22	Fri 2/25/22	
20		1.1.4	**Contract Negotiations**	**16 days**		**No**	**Mon 2/28/22**	**Mon 3/21/22**	
21		1.1.4.1	letter to succesful bidders	1 day	19	No	Mon 2/28/22	Mon 2/28/22	
22		1.1.4.2	Start negotiations	10 days	21	No	Tue 3/1/22	Mon 3/14/22	
23		1.1.4.3	final draft contract	2 days	22	No	Tue 3/15/22	Wed 3/16/22	
24		1.1.4.4	No-objection WB Contract	3 days	23	No	Thu 3/17/22	Mon 3/21/22	
25		1.1.5	**Contract Signing**	**13 days**		**No**	**Tue 3/22/22**	**Thu 4/7/22**	
26		1.1.5.1	letter thanking other Firms	1 day	24	No	Tue 3/22/22	Tue 3/22/22	
27		1.1.5.2	Stand Still period	10 days	26	No	Wed 3/23/22	Tue 4/5/22	
28		1.1.5.3	Contract Signing	1 day	27	Yes	Wed 4/6/22	Wed 4/6/22	
29		1.1.5.4	upload contract, completing WB process	1 day	28	No	Thu 4/7/22	Thu 4/7/22	
30		1.2	**Procurement Hydro Met Stations**	**135 days**		**No**	**Thu 4/7/22**	**Wed 10/12/22**	
31		1.2.1	**Hydro-Met Station Choice**	**45 days**		**No**	**Thu 4/7/22**	**Wed 6/8/22**	
32		1.2.1.1	analyse existing stations	14 days	28	No	Thu 4/7/22	Tue 4/26/22	
33		1.2.1.2	report on additional stations	10 days	32	No	Wed 4/27/22	Tue 5/10/22	
34		1.2.1.3	design stations	21 days	33	No	Wed 5/11/22	Wed 6/8/22	
35		1.2.2	**Tender Documents**	**4 days**		**No**	**Fri 8/12/22**	**Wed 8/17/22**	
36		1.2.2.1	prepare tender documents	1 day	34,62	No	Fri 8/12/22	Fri 8/12/22	
37		1.2.2.2	No-objection WB tender docs	3 days	36	No	Mon 8/15/22	Wed 8/17/22	
38		1.2.3	**Publication**	**1 day**		**No**	**Thu 8/18/22**	**Thu 8/18/22**	
39		1.2.3.1	launch Ad	1 day	37	Yes	Thu 8/18/22	Thu 8/18/22	
40		1.2.3.2	publish on WB business forum	1 day	37	No	Thu 8/18/22	Thu 8/18/22	
41		1.2.4	**Tender Supply & Works**	**17 days**		**No**	**Fri 8/19/22**	**Mon 9/12/22**	
42		1.2.4.1	Site Visit	1 day	39	No	Fri 8/19/22	Fri 8/19/22	
43		1.2.4.2	Tender information session	1 day	42	No	Mon 8/22/22	Mon 8/22/22	
44		1.2.4.3	Clarifications	1 day	43	No	Tue 8/23/22	Tue 8/23/22	
45		1.2.4.4	receive bids	1 day	44	No	Wed 8/24/22	Wed 8/24/22	
46		1.2.4.5	evaluate bids	10 days	45	No	Thu 8/25/22	Wed 9/7/22	
47		1.2.4.6	N-O WB start contract negotiations	3 days	46	No	Thu 9/8/22	Mon 9/12/22	
48		1.2.5	**Contract Negotiations**	**9 days**		**No**	**Tue 9/13/22**	**Fri 9/23/22**	
49		1.2.5.1	letter to succesful bidders	1 day	47	No	Tue 9/13/22	Tue 9/13/22	
50		1.2.5.2	final draft contract	5 days	49	No	Wed 9/14/22	Tue 9/20/22	
51		1.2.5.3	N-O WB for contract signing	3 days	50	No	Wed 9/21/22	Fri 9/23/22	
52		1.2.6	**Contract Signing**	**13 days**		**No**	**Mon 9/26/22**	**Wed 10/12/22**	
53		1.2.6.1	letter to not selected bidders	1 day	51	No	Mon 9/26/22	Mon 9/26/22	
54		1.2.6.2	notification to award	1 day	53	No	Tue 9/27/22	Tue 9/27/22	
55		1.2.6.3	stand still period	10 days	54	No	Wed 9/28/22	Tue 10/11/22	

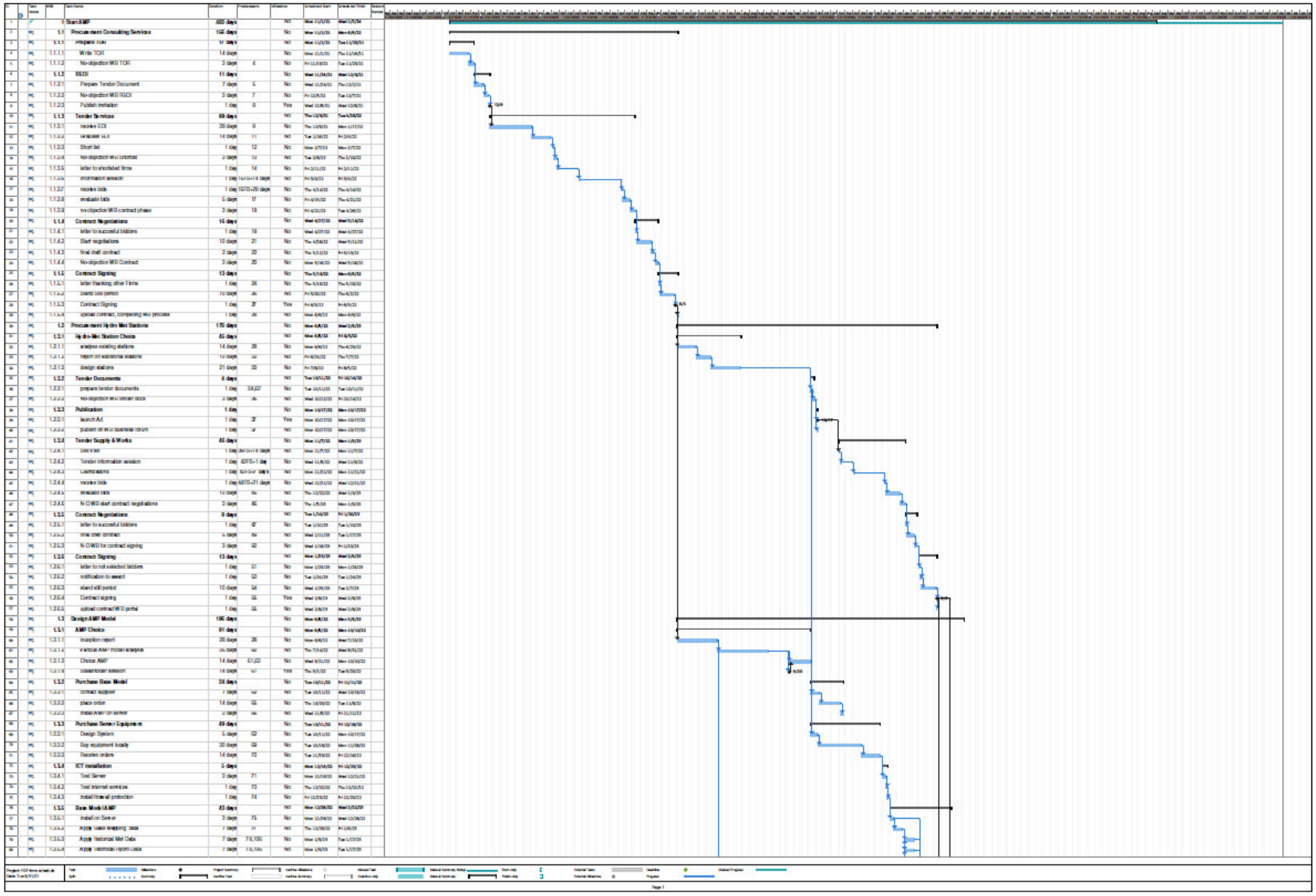
FGP time schedule

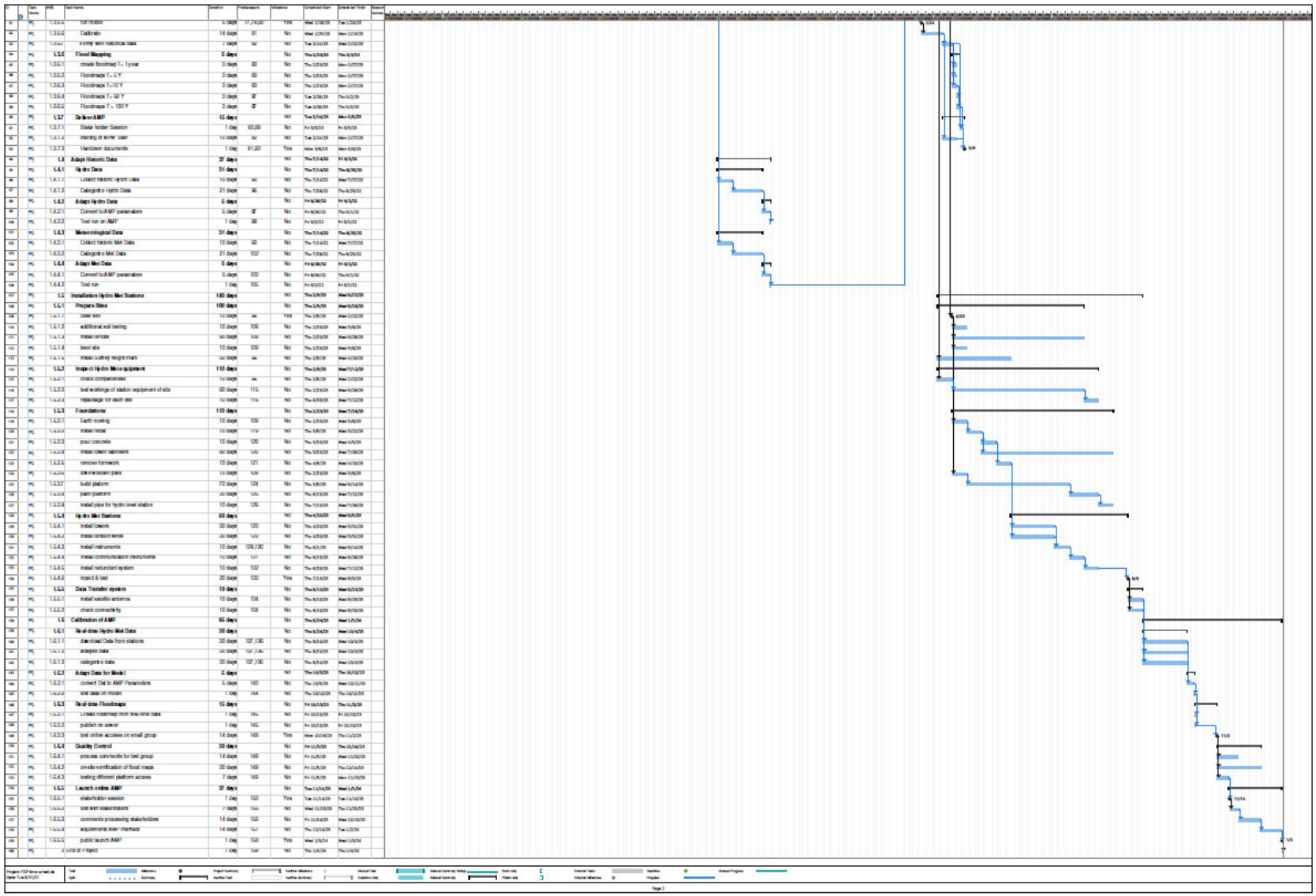
ID	Task Mode	WBS	Task Name	Duration	Predecessors	Milestone	Scheduled Start	Scheduled Finish	Resource Names
56		1.2.6.4	Contract signing	1 day	55	Yes	Wed 10/12/22	Wed 10/12/22	
57		1.2.6.5	upload contract WB portal	1 day	55	No	Wed 10/12/22	Wed 10/12/22	
58		**1.3**	**Design AMP Model**	**196 days**		**No**	**Thu 4/7/22**	**Thu 1/5/23**	
59		**1.3.1**	**AMP Choice**	**91 days**		**No**	**Thu 4/7/22**	**Thu 8/11/22**	
60		1.3.1.1	inception report	28 days	28	No	Thu 4/7/22	Mon 5/16/22	
61		1.3.1.2	Various AMP model analysis	35 days	60	No	Tue 5/17/22	Mon 7/4/22	
62		1.3.1.3	Choice AMP	14 days	61,63	No	Mon 7/25/22	Thu 8/11/22	
63		1.3.1.4	Stakeholder session	14 days	61	Yes	Tue 7/5/22	Fri 7/22/22	
64		**1.3.2**	**Purchase Base Model**	**24 days**		**No**	**Fri 8/12/22**	**Wed 9/14/22**	
65		1.3.2.1	contact supplier	7 days	62	No	Fri 8/12/22	Mon 8/22/22	
66		1.3.2.2	place order	14 days	65	No	Tue 8/23/22	Fri 9/9/22	
67		1.3.2.3	install AMP on server	3 days	66	No	Mon 9/12/22	Wed 9/14/22	
68		**1.3.3**	**Purchase Server Equipment**	**49 days**		**No**	**Fri 8/12/22**	**Wed 10/19/22**	
69		1.3.3.1	Design System	5 days	62	No	Fri 8/12/22	Thu 8/18/22	
70		1.3.3.2	Buy equipment locally	30 days	69	No	Fri 8/19/22	Thu 9/29/22	
71		1.3.3.3	Receive orders	14 days	70	No	Fri 9/30/22	Wed 10/19/22	
72		**1.3.4**	**ICT installation**	**5 days**		**No**	**Thu 10/20/22**	**Wed 10/26/22**	
73		1.3.4.1	Test Server	3 days	71	No	Thu 10/20/22	Mon 10/24/22	
74		1.3.4.2	Test internet services	1 day	73	No	Tue 10/25/22	Tue 10/25/22	
75		1.3.4.3	install firewall protection	1 day	74	No	Wed 10/26/22	Wed 10/26/22	
76		**1.3.5**	**Base Model AMP**	**43 days**		**No**	**Thu 10/27/22**	**Mon 12/26/22**	
77		1.3.5.1	install on Server	3 days	75	No	Thu 10/27/22	Mon 10/31/22	
78		1.3.5.2	Apply Base Mapping data	7 days	77	No	Tue 11/1/22	Wed 11/9/22	
79		1.3.5.3	Apply historical Met Data	7 days	78,106	No	Thu 11/10/22	Fri 11/18/22	
80		1.3.5.4	Apply Histroical Hydro Data	7 days	78,106	No	Thu 11/10/22	Fri 11/18/22	
81		1.3.5.5	run model	5 days	77,79,80	Yes	Mon 11/21/22	Fri 11/25/22	
82		1.3.5.6	Calibrate	14 days	81	No	Mon 11/28/22	Thu 12/15/22	
83		1.3.5.7	verrify with historical data	7 days	82	No	Fri 12/16/22	Mon 12/26/22	
84		**1.3.6**	**Flood Mapping**	**6 days**		**No**	**Tue 12/27/22**	**Tue 1/3/23**	
85		1.3.6.1	create floodmap T= 1 year	3 days	83	No	Tue 12/27/22	Thu 12/29/22	
86		1.3.6.2	Floodmaps T= 5 Y	3 days	83	No	Tue 12/27/22	Thu 12/29/22	
87		1.3.6.3	Floodmaps T=10 Y	3 days	83	No	Tue 12/27/22	Thu 12/29/22	
88		1.3.6.4	Floodmaps T= 50 Y	3 days	87	No	Fri 12/30/22	Tue 1/3/23	
89		1.3.6.5	Floodmaps T = 100 Y	3 days	87	No	Fri 12/30/22	Tue 1/3/23	
90		**1.3.7**	**Deliver AMP**	**15 days**		**No**	**Fri 12/16/22**	**Thu 1/5/23**	
91		1.3.7.1	Stake holder Session	1 day	83,89	No	Wed 1/4/23	Wed 1/4/23	
92		1.3.7.2	training of MPW Staff	10 days	82	No	Fri 12/16/22	Thu 12/29/22	
93		1.3.7.3	Handover documents	1 day	91,92	Yes	Thu 1/5/23	Thu 1/5/23	
94		**1.4**	**Adapt Historic Data**	**37 days**		**No**	**Tue 5/17/22**	**Wed 7/6/22**	
95		**1.4.1**	**Hydro Data**	**31 days**		**No**	**Tue 5/17/22**	**Tue 6/28/22**	
96		1.4.1.1	Collect historic Hydro Data	10 days	60	No	Tue 5/17/22	Mon 5/30/22	
97		1.4.1.2	Categorize Hydro Data	21 days	96	No	Tue 5/31/22	Tue 6/28/22	
98		**1.4.2**	**Adapt Hydro Data**	**6 days**		**No**	**Wed 6/29/22**	**Wed 7/6/22**	
99		1.4.2.1	Convert to AMP paramaters	5 days	97	No	Wed 6/29/22	Tue 7/5/22	
100		1.4.2.2	Test run on AMP	1 day	99	No	Wed 7/6/22	Wed 7/6/22	
101		**1.4.3**	**Meteorological Data**	**31 days**		**No**	**Tue 5/17/22**	**Tue 6/28/22**	
102		1.4.3.1	Collect historic Met Data	10 days	60	No	Tue 5/17/22	Mon 5/30/22	
103		1.4.3.2	Categorize Met Data	21 days	102	No	Tue 5/31/22	Tue 6/28/22	
104		**1.4.4**	**Adapt Met Data**	**6 days**		**No**	**Wed 6/29/22**	**Wed 7/6/22**	
105		1.4.4.1	Convert to AMP paramaters	5 days	103	No	Wed 6/29/22	Tue 7/5/22	
106		1.4.4.2	Test run	1 day	105	No	Wed 7/6/22	Wed 7/6/22	
107		**1.5**	**Installation Hydro Met Stations**	**140 days**		**No**	**Thu 10/13/22**	**Wed 4/26/23**	
108		**1.5.1**	**Prepare Sites**	**100 days**		**No**	**Thu 10/13/22**	**Wed 3/1/23**	
109		1.5.1.1	clear site	10 days	56	Yes	Thu 10/13/22	Wed 10/26/22	
110		1.5.1.2	additional soil testing	10 days	109	No	Thu 10/27/22	Wed 11/9/22	

FGP time schedule

ID	Task Mode	WBS	Task Name	Duration	Predecessors	Milestone	Scheduled Start	Scheduled Finish	Resource Names
111		1.5.1.3	install fences	90 days	109	No	Thu 10/27/22	Wed 3/1/23	
112		1.5.1.4	level site	10 days	109	No	Thu 10/27/22	Wed 11/9/22	
113		1.5.1.5	install Survey height mark	50 days	56	No	Thu 10/13/22	Wed 12/21/22	
114		**1.5.2**	**Inspect Hydro Met equipment**	**110 days**		**No**	**Thu 10/13/22**	**Wed 3/15/23**	
115		1.5.2.1	check completeness	10 days	56	No	Thu 10/13/22	Wed 10/26/22	
116		1.5.2.2	test workings of station equipment of site	90 days	115	No	Thu 10/27/22	Wed 3/1/23	
117		1.5.2.3	repackage for each site	10 days	116	No	Thu 3/2/23	Wed 3/15/23	
118		**1.5.3**	**Foundations**	**110 days**		**No**	**Thu 10/27/22**	**Wed 3/29/23**	
119		1.5.3.1	Earth moving	10 days	109	No	Thu 10/27/22	Wed 11/9/22	
120		1.5.3.2	install rebar	10 days	119	No	Thu 11/10/22	Wed 11/23/22	
121		1.5.3.3	pour concrete	10 days	120	No	Thu 11/24/22	Wed 12/7/22	
122		1.5.3.4	install tower fastneers	90 days	120	No	Thu 11/24/22	Wed 3/29/23	
123		1.5.3.5	remove formwork	10 days	121	No	Thu 12/8/22	Wed 12/21/22	
124		1.5.3.6	drive wooden piles	10 days	109	No	Thu 10/27/22	Wed 11/9/22	
125		1.5.3.7	build plaform	70 days	124	No	Thu 11/10/22	Wed 2/15/23	
126		1.5.3.8	paint platform	20 days	125	No	Thu 2/16/23	Wed 3/15/23	
127		1.5.3.9	install pipe for hydro level station	10 days	126	No	Thu 3/16/23	Wed 3/29/23	
128		**1.5.4**	**Hydro Met Stations**	**80 days**		**No**	**Thu 12/22/22**	**Wed 4/12/23**	
129		1.5.4.1	install towers	30 days	123	No	Thu 12/22/22	Wed 2/1/23	
130		1.5.4.2	install tension wires	30 days	123	No	Thu 12/22/22	Wed 2/1/23	
131		1.5.4.3	install instruments	10 days	129,130	No	Thu 2/2/23	Wed 2/15/23	
132		1.5.4.4	Install communication instruments	10 days	131	No	Thu 2/16/23	Wed 3/1/23	
133		1.5.4.5	install redundent system	10 days	132	No	Thu 3/2/23	Wed 3/15/23	
134		1.5.4.6	inpect & test	20 days	133	Yes	Thu 3/16/23	Wed 4/12/23	
135		**1.5.5**	**Data Transfer system**	**10 days**		**No**	**Thu 4/13/23**	**Wed 4/26/23**	
136		1.5.5.1	install satelite antenna	10 days	134	No	Thu 4/13/23	Wed 4/26/23	
137		1.5.5.2	check connectivity	10 days	134	No	Thu 4/13/23	Wed 4/26/23	
138		**1.6**	**Calibration of AMP**	**95 days**		**No**	**Thu 4/27/23**	**Wed 9/6/23**	
139		**1.6.1**	**Real-time Hydro Met Data**	**30 days**		**No**	**Thu 4/27/23**	**Wed 6/7/23**	
140		1.6.1.1	download Data from stations	30 days	137,136	No	Thu 4/27/23	Wed 6/7/23	
141		1.6.1.2	analyse data	30 days	137,136	No	Thu 4/27/23	Wed 6/7/23	
142		1.6.1.3	categorize data	30 days	137,136	No	Thu 4/27/23	Wed 6/7/23	
143		**1.6.2**	**Adapt Data for Model**	**6 days**		**No**	**Thu 6/8/23**	**Thu 6/15/23**	
144		1.6.2.1	convert Dat to AMP Parameters	5 days	140	No	Thu 6/8/23	Wed 6/14/23	
145		1.6.2.2	test data on model	1 day	144	No	Thu 6/15/23	Thu 6/15/23	
146		**1.6.3**	**Real-time Floodmaps**	**15 days**		**No**	**Fri 6/16/23**	**Thu 7/6/23**	
147		1.6.3.1	Create floodmap from real-time data	1 day	145	No	Fri 6/16/23	Fri 6/16/23	
148		1.6.3.2	publish on server	1 day	145	No	Fri 6/16/23	Fri 6/16/23	
149		1.6.3.3	test online accesss on small group	14 days	148	Yes	Mon 6/19/23	Thu 7/6/23	
150		**1.6.4**	**Quality Control**	**30 days**		**No**	**Fri 7/7/23**	**Thu 8/17/23**	
151		1.6.4.1	process comments for test group	14 days	149	No	Fri 7/7/23	Wed 7/26/23	
152		1.6.4.2	on-site verrification of flood maps	30 days	149	No	Fri 7/7/23	Thu 8/17/23	
153		1.6.4.3	testing different platform access	7 days	149	No	Fri 7/7/23	Mon 7/17/23	
154		**1.6.5**	**Launch online AMP**	**37 days**		**No**	**Tue 7/18/23**	**Wed 9/6/23**	
155		1.6.5.1	stakeholder session	1 day	153	Yes	Tue 7/18/23	Tue 7/18/23	
156		1.6.5.2	test with stakeholders	7 days	155	No	Wed 7/19/23	Thu 7/27/23	
157		1.6.5.3	comments processing stakeholders	14 days	156	No	Fri 7/28/23	Wed 8/16/23	
158		1.6.5.4	adjustments AMP interface	14 days	157	No	Thu 8/17/23	Tue 9/5/23	
159		1.6.5.5	public launch AMP	1 day	158	Yes	Wed 9/6/23	Wed 9/6/23	
160		2	End of Project	1 day	159	No	Thu 9/7/23	Thu 9/7/23	

Appendix 6: Schedule





Appendix 7: Network Diagram AMP