

UNIVERSIDAD PARA LA COOPERACIÓN INTERNACIONAL  
(UCI)

FINAL GRADUATION PROJECT  
PROJECT MANAGEMENT PLAN FOR THE RIVERBANK RESTORATION  
PROJECT

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

To my dear Puerto Rico .... hurricanes, earthquakes, and constant political conflicts have been attacking you for so long; however, you have shown courage and strength to manage, recover, and continue to shine before the world!

## **ACKNOWLEDGMENTS**

My deep gratitude goes to my patient and excellent coach, Osvaldo, and to the UCI university management for providing students from all countries the opportunity of achieving a graduate degree through a virtual mode. I am very excited and committed to the career advancement I am achieving with this degree. I have acquired vast knowledge, extraordinary friends, and a new way to see myself for my future to come.

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## ABBREVIATIONS AND ACRONYMS

FGP - Final Graduation Project

FF - Finish to Finish

FS - Finish to Start

López, R – López, Rosa (Final Graduation Project Author's Name)

MS – Microsoft

*PMBOK® Guide: Project Management Body of Knowledge Guide*

PMI - Project Management Institute

PM – Project Management

PMP - Project Management Plan

PR – Puerto Rico

RGBRP - Restoration Gurabo Bank River Project

SF – Start to Finish

SS- Start to Start

RBS – Risk Breakdown Structure

WBS - Work Breakdown Structure

## EXECUTIVE SUMMARY

AML, one of the principal biotechnological companies of the world and located in Juncos, Puerto Rico, has executed thousands of successful projects related to manufacturing operation development, which are identified as “capital projects”. However, AML has failed to provide positive results in its non-operational projects, which are identified as “expense projects”.

The use of standardized procedures in AML’s capital projects and other operations has proven to provide task completion while controlling and measuring results. The lack of applicability of standardized procedures for the “expense projects” lead to ambiguity, unreliability, and failure. On September 20, 2017, Hurricane Maria devastated Puerto Rico, triggering a significant increase of “expense projects” in AML. To successfully execute the AML proposed project to restore 300 meters of damaged river bank in Juncos, Puerto Rico, a comprehensive project management plan had to be developed.

The general objective is to develop a project management plan, framed within the standards established by the Project Management Institute (PMI), to improve the chances of success of the Rio Gurabo Bank Restoration Project (RGBRP). The specific objectives are to develop the Integration Management Plan in order to unify and coordinate the processes and project management activities; to create a scope management plan to define key stakeholders’ project requirements and expectations; to create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly; to create a cost management plan for assigning cost to work packages, to be monitored and controlled accordingly; to develop a quality management plan for outlining the stakeholders’ acceptance criteria to be addressed with the project execution; to create a resource management plan for assigning adequate human and physical resources to project work packages; to develop a communications management plan for clearly defining the project communication strategies; to create a risk management plan that identifies and prioritizes risks, provides the corresponding

risk response approach for the project, and identifies potential opportunities; to develop a procurement management plan for identifying and assigning the contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations; and to develop a stakeholder management plan that identifies key stakeholders, their level of interest, and their impact/influence on the project to ensure their engagement.

A qualitative research methodology was used for preparing this FGP. The data required were based on the PMBOK® Guide methodology content and were obtained through interviews with several stakeholders. The data gathered were organized and evaluated through thematic analysis, in complement with the expert judgment of the author, and validated by the tutors that provided support along the process. The research and analysis outcomes were used to create each subcomponent of the project management plan for the AML Riverbank Restoration Project.

The resulting project management plan managed to cover all aspects of the project that needed to be identified, analyzed, and controlled to ensure project completion on time, on budget, and within quality and regulatory specifications. Metrics to monitor and control schedule, quality, performance, and budget were identified, along with the communication procedures and reporting methods to ensure project progress and control variances. Eventhough there was limited documented information to be used as a reference for the project management plan preparation, the RGBR project management plan is robust. The plan documented the time and cost constraints and included the associated risks and opportunities and related mitigation and management recommendations. Nature, environment, regulations, and codes were considered in every complementary plan and attended inside the scope requirements, quality monitoring, and risk identification and management. The RGBR project management plan will become the first step for AML towards achieving efficiency and positive results in the expense projects, but the creation of additional project management plans more related to the manufacturing operations of AML is still needed for better understanding and a real perspective of the normal projects managed by AML everyday.

## **1. INTRODUCTION**

### **1.1 Background**

This final graduation project is focused on improving the project's performance processes for AML, one of the leading biotechnological companies of the world. AML is a value-based company, deeply rooted in science and innovation to transform new ideas and discoveries into medicines for patients with serious illnesses. To do so, it is constantly improving its manufacturing mechanisms, infrastructure, and technology through the implementation of several projects. Projects in AML are divided in two areas: capital projects, which are the ones that are directly related to the operational and economic development and the expense projects, which are the ones that do not provide a direct economic benefit to the company.

Even though AML follows very strict standards and integrates best practices in all its operations, as of today, the projects which are not related directly to an increase of revenues have not been managed as the capital projects have. This difference in planning and management has resulted in project failure increase, stakeholders and team members' frustration, and economical losses. These effects have been more noticeable since Hurricane Maria stroke Puerto Rico in September 20, 2017.

The Gurabo River Bank (RGBRP) is one of the projects proposed by AML to provide support to the Juncos community by repairing a damaged area affected by extreme floods resulting from Hurricane Maria. Rio Gurabo Bank Restoration requires the stabilization of a riverbank segment of approximately 350 meters at the Gurabo River in Puerto Rico. Since the project does not involve any manufacturing operation or capital generation, no project management methodology has been applied to it, making its execution impossible. The results of this final graduation project will ensure that the adequate plans are established to execute the RGBRP successfully and to ensure all (capital and expense) AML projects will follow the same methodologies and good project management practices to ensure expected results and projects' success.

## **1.2 Statement of the Problem**

There is an opportunity for improving the planning process on the projects which AML categorizes as expense projects (projects that are not directly related to economic benefits). Since 1982, AML has executed thousands of successful capital projects with outstanding results, but that hasn't been the case with the projects identified as "expense projects". For the "expense projects", there has been no formal integration of any project planning methodology, which has resulted in a success rate of only 20%, failure to comply with scope requirements, and more than half of the projects being completed over budget, out of schedule, or even worse, some were never completed.

Since the absence of a formal project management plan is preventing the effective planning, execution, and control of AML expense projects, the RGRBP Project Management Plan would be developed to address this situation and to provide the base to follow for the upcoming expense projects of AML.

## **1.3 Purpose**

As it has been mentioned in previous sections, the purpose of this final graduation project is the creation of a project management plan to improve the chances of success of the AML project identified as RGRBP. Since the RGRBP neither relates to the normal manufacturing operations nor to tangible economic benefits, it is a project that has not followed the standard project management methodologies applied to capital projects, so its progress has not been possible. The project management plan will be developed to address this existing problem of lack of guidance and management on projects that are not classified as "capital projects" by detailing the management of all critical aspects of the project. Each step is to be coordinated strategically to develop all of the subsidiary documents, which will be used as a guide during project execution.

The Project Management Institute (PMI) and a Guide to the Project Management Body of Knowledge (PMBOK® Guide) define a project management plan (PMP) as a formal approved document that defines the overall plan for how the project will be executed, monitored, and controlled. A project management plan includes baselines, subsidiary



management plans, and other planning documents to define the approach that the project team will take to deliver guidance and direction for specific management, planning, and control of activities, such as schedule, cost, risk, staffing, change control, communications, quality, and procurement. In addition, as the work proceeds, it allows to measure the performance of the project against the performance measurement baselines included in the project management plan and ensures that corresponding adjustments or change requests are made to correct/mitigate any deviation.

The principal benefit that will result from the creation of this particular project management plan is the confirmation of the importance of managing consistently all types of projects through a formal project management methodology to ensure timely, costly, controlled, and quality driven project results. In fact, this project management plan will provide the basis to integrate the project management methodologies in all types of projects managed by AML Company. Finally, but not least important, this project management plan will provide the motivation for all stakeholders to move forward to solve the erosion problems that are threatening the community's safety.

#### **1.4 General Objective**

To develop a project management plan, framed within the standards established by the Project Management Institute (PMI), to improve the chances of success of the Rio Gurabo Bank Restoration Project (RGBRP).

#### **1.5 Specific Objectives**

The FGP specific objectives are:

1. To develop the Integration Management Plan in order to unify and coordinate the processes and project management activities.
2. To create a scope management plan to define key stakeholders' project requirements and expectations.

3. To create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly.
4. To create a cost management plan for assigning cost to work packages, to be monitored and controlled accordingly.
5. To develop a quality management plan for outlining the stakeholders' acceptance criteria to be addressed with the project execution.
6. To create a resource management plan for assigning adequate human and physical resources to project work packages.
7. To develop a communications management plan for clearly defining the project communication strategies .
8. To create a risk management plan that identifies and prioritizes risks, provides the corresponding risk response approach for the project, and identifies potential opportunities.
9. To develop a procurement management plan for identifying and assigning the contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations.
10. To develop a stakeholder management plan that identifies key stakeholders, their level of interest, and their impact/influence on the project to ensure their engagement.

## **2. THEORETICAL FRAMEWORK**

### **2.1 Company/Enterprise Framework**

#### **2.1.1 Company/Enterprise Background**

AML is one of the world's leading biotechnology companies, located in Juncos, Puerto Rico. It is a value-based company, deeply rooted in science and innovation to transform new ideas and discoveries into medicines for patients with serious illnesses. AML is focused on manufacturing biological medications to provide a better quality of life to patients with different syndromes and diseases. In order to be able to continue manufacturing the best products with excellent quality and outstanding effectiveness, AML has a project department area in charge of the planning and execution of the proposed projects.

#### **2.1.2 Mission and Vision Statements**

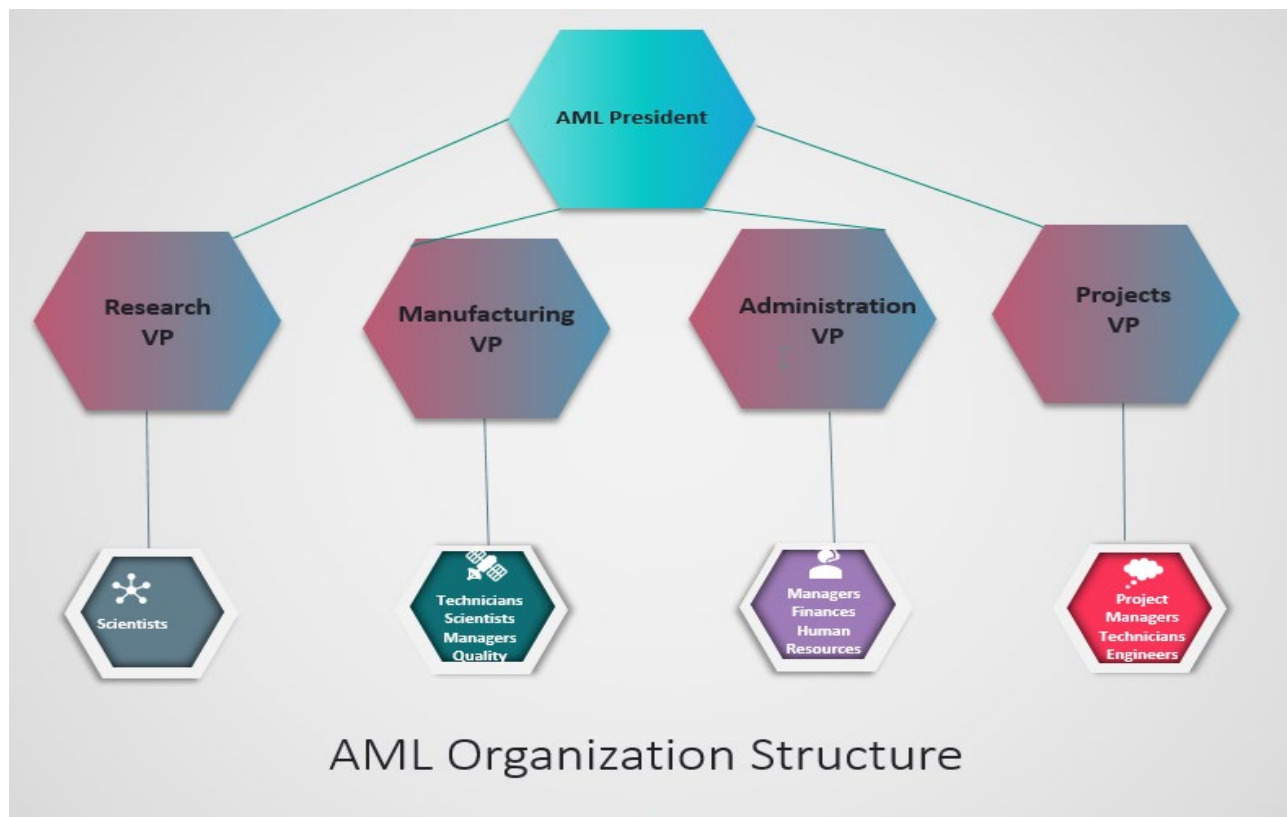
AML's mission is to serve patients, while its vision is that: "AML strives to serve patients by transforming the promise of science and biotechnology into therapies that have the power to restore health or save lives". AML aims to fulfill the mission to serve patients in everything it does. AML is guided by the following values every step of the way:

- To be science-based
- To compete intensely and win
- To value creation
- To trust and respect

AML is committed to the patients and the community. Amgen is continuously proposing projects that enhance its manufacturing processes and also projects that provide support to the community and the environment. That is the reason for the importance of ensuring that those projects that seek to support the community and environment can be performed with the best results and timing to ensure that other similar projects can be executed.

### 2.1.3 Organizational Structure

AML is one of the biggest companies in Puerto Rico, having approximately 2,500 regular employees and 2,000 contractors. AML's organizational structure is divided in the most important areas of the company: Manufacturing, Research, Administration, and Projects. The figure below summarizes the existing organizational structure:



**Figure 1. AML Organizational Structure** Reprinted from AML Organizational Procedure revision 5, September 2019

### 2.1.4 Products Offered

AML produces medicines to treat anemia, migraine, acute lymphoblastic leukemia, and osteoporosis. To be able to manufacture all those products on time in compliance and with the best quality, several projects are continuously planned and executed. AML also provides benefits to the immediate community through welfare and environmental sustainability projects.

## **2.2 Project Management Concepts**

### **2.2.1 Project**

A project is defined as “a temporary endeavor undertaken to create a unique product, service, or result (PMI, 2017, p.8). Projects can be classified depending on the organizational perspective. For AML, the projects are classified as capital projects and expense projects. The applicability criteria of a project management methodology in AML depends on how the project is classified.

According to The Law Dictionary, “projects which purchase, or construct capital assets are known as capital projects” (The Law Dictionary, n.d.). Typically, a capital project encompasses a purchase of land and/or construction building or facility. Assets increase a company’s value and economic wealth, while expense projects reduce a company’s assets in hopes of obtaining any indirect return of profit by increasing value through retained earnings. Project success has been historically defined as a project that meets its objectives under budget and under schedule. Efficiency is related to how the project manages its limited resources to meet the goals while building good relationships with internal and external stakeholders. Uncontrolled, unplanned projects are a threat to project success. AML Company has been successful in executing is capital projects, but results haven’t been the same with the ones classified as expense projects, which are not managed or controlled with a standard project management methodology.

### **2.2.2 Project Management**

Implementing project management across an organization helps to create a strategic value chain that gives companies an edge over their competitors. Being able to bring projects on time and within budget is determinant for a project performance success. To keep that competitive edge, the organizations need to apply their project management strategies in every project and align them within the strategic business goals. Project management methodologies (application of processes and knowledge areas) have been developed specially to help address low success rates using project-related

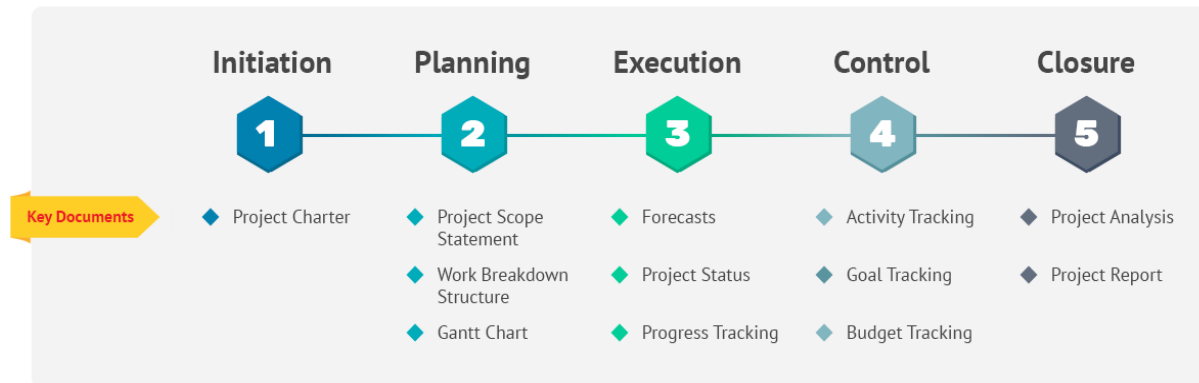
knowledge (Wysocki, 2011). Government bodies have helped to establish standards in methodologies and guidelines with their tools, techniques, processes, and procedures (Morris, Crawford, Hodgson, Shepherd, & Thomas, 2006). Research has shown that project methodologies provide more predictable project success than projects that do not use one (Lehtonen & Martinsuo, 2006; Wells, 2012).

What are the motives in which an organization must introduce standardized management processes? There are two main reasons: (1) a standard supports the work within the organization in which it guides processes and methods, whose application directly improves the quality of work and results. In this case, the extent of its spread will play a much smaller role than a standard's quality; (2) the standard supports one's own work by simplifying collaboration with customers and suppliers by strengthening trust in both directions. Since the projects don't manage themselves, the development of a standard way (plan) that outlines how it will be managed is required. That is the importance of managing all projects, no matter their classification, through a standard project management methodology.

The development of the final graduation project (FGP) will consist of the creation of the project management plan for the restoration of the riverbank in Juncos, P.R.

### **2.2.3 Project Life Cycle**

The *PMBOK*® Guide defines the project life cycle as “the series of phases that a project passes through from its initiation to its closure” (PMI, 2017, p.547). The project life cycle contains every phase that your project goes through from beginning to end. Projects may have different dimensions and difficulty levels, but, whatever the size: large or small or capital or expense, all projects could be mapped to the given lifecycle structure. “The life cycle provides the basic framework for managing the project, regardless of the specific work involved” (PMI, 2017, p.548). Figure 2 provides a graphical view of the life cycle process breakdown in five phases and their key documents.



**Figure 2. Project Life cycle General Phases. Reprinted from What is Project Life Cycle and How to Use it Better. Cohen, E. 2018.**

### 2.2.4 Project Management Processes

The final graduation plan proposes the creation of a project management plan with its subsidiary documents that are to contain the detailed process to apply throughout all project phases.

The PMBOK® Guide identifies the project management processes grouped in 10 separate knowledge areas, all to be considered during the lifecycle of the FGP (PMI, 2017). The process groups are the chronological phases that the project goes through, and the knowledge areas occur throughout any time during the 49 process groups. The process groups are horizontal, and the knowledge areas are vertical.

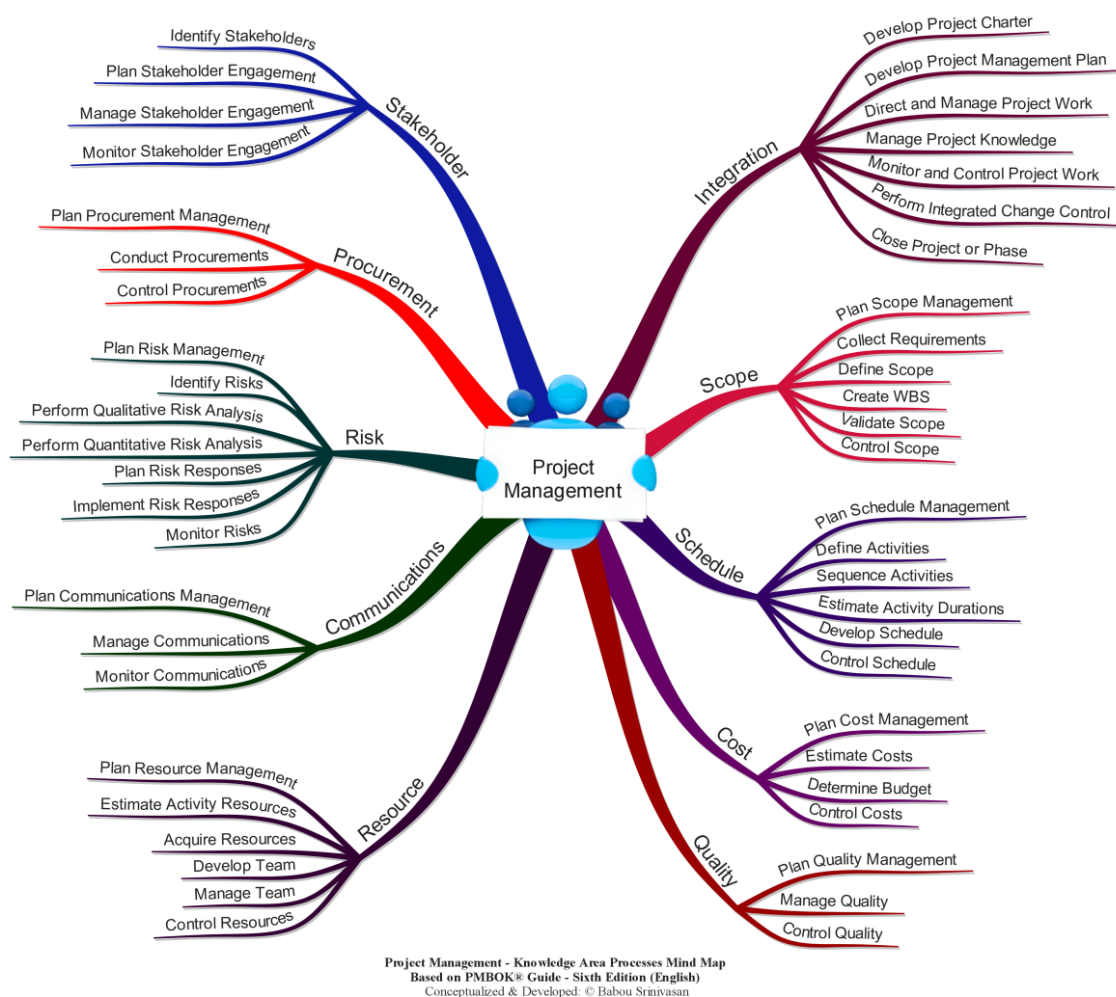
Knowledge Area	Process Groups				
	Initiation	Planning	Execution	Monitoring & Control	Closing
Integration Management	Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Work	1. Monitor & Control Project Work 2. Perform Integrated Change Control	Close Project or Phase
Scope Management		1. Plan Scope Management 2. Collect requirements 3. Define Scope 4. Create WBS		1. Validate Scope 2. Control Scope	
Time Management		1. Plan Schedule Management 2. Define Activities 3. Sequence Activities 4. Estimate Activity Resources 5. Estimate Activity Durations 6. Develop Schedule		Control Schedule	
Cost Management		1. Plan Cost Management 2. Estimate Costs 3. Determine Budget		Control Costs	
Quality Management		Plan Quality Management	Perform Quality Assurance	Control Quality	
Human Resource Management		Plan Human Resource Management	1. Acquire Project team 2. Develop Project Team 3. Manage Project team		
Communications Management		Plan Communications Management	Manage communications	Control Communications	
Risk Management		1. Plan Risk Management 2. Identify risks 3. Perform Qualitative Risk Analysis 4. Perform Quantitative Risk Analysis 5. Plan Risk Responses		Control Risks	
Procurement Management		Plan Procurement Management	Conduct Procurements	Control Procurements	Close Procurements
Stakeholder Management	Identify Stakeholders	Plan Stakeholder Management	Manage Stakeholder engagement	Control Stakeholder Engagement	

**Figure 2. PMI Methodology: PM Process Groups and Knowledge Areas. Reprinted from Project Management Basics, Copyright 2017**



## 2.2.5 Project Management Knowledge Areas

A knowledge area represents a complete set of concepts, terms, and activities that make up an area of specialization. According to the PMBOK® Guide, there are ten (10) knowledge areas, which are: integration management, scope management, time management, cost management, quality management, human resource management, communications management, risk management, procurement management, and stakeholder management (PMI, 2017, p.553).



**Figure 3. Project Management-Knowledge Areas Processes Mind Map. Reprinted from Project Management and Leadership Champions. Conceptualized and Developed by Srinivasan, B.**

### **2.2.5.1 Project Integration Management**

The main purpose of the integration management is to manage and coordinate all the processes and activities during the project life cycle. It includes all fundamental plans, starting by developing a project charter that is created during the initiation phase. This is the document that sets up the project and assigns the project manager.

Another aspect of this area is the project management plan, which is developed as a project roadmap for the project to reach a successful end. Once created, the project plan is approved by stakeholders and/or sponsors, and then it is monitored and tracked through a change log as the project progresses. The project integration area also includes the directing and managing of the project work, which is the production of its deliverables. This process is monitored, analyzed, and reported on to identify and control any changes or problems that might occur.

### **2.2.5.2 Project Scope Management**

The project scope management relates to the work of the project and when a detailed requirement for the final product or service is collected. In it, a scope statement is to be defined, and a work breakdown structure (WBS), which is a graphic breakdown of project work, is to be prepared.

Scope is validated during the project, which means making sure that the deliverables are being approved regularly by the sponsor or stakeholder. This occurs during the monitoring and controlling process groups, and it is about accepting the deliverables, not the specs laid out during planning.

In summary, there are five sub-processes involved in the project scope management process which are:

- i. Collect requirements
- ii. Define scope
- iii. Create work breakdown structure
- iv. Verify scope
- v. Control scope

### **2.2.5.3 Project Time Management.**

For the time management process, and based on the PMBOK, there are the six sub-processes, which are:

1. Define activities
2. Sequence activities
3. Estimate the resources required
4. Estimate the time required
5. Develop a schedule
6. Control schedule

All projects are divided into tasks, which are scheduled with start dates and deadlines, as well as budgets for each task. Since things are constantly changing over the phases of any project, continuous review is required through project time management. In order to manage project time appropriately, a project schedule is to be created to include who is responsible for each task of the project. These tasks are then put in an order that makes sense, and any dependency between them is noted. These dependencies are then determined to be either finish-to-start (FS), finish-to-finish (FF), start-to-start (SS), or start-to-finish (SF). With the tasks correctly sequenced, the resources required for each must be estimated and assigned. All this will lead to a schedule by figuring out the critical path and float for each task.

Once the schedule is made, plans to control the schedule are necessary. Earned value management is performed regularly to make sure that the actual plan is proceeding as it had been planned.

### **2.2.5.4 Project Cost Management**

Project cost management involves the project budget, which means having good estimating tools to make sure that the funds cover the extent of the project and are being monitored regularly to keep stakeholders or sponsors informed. Plan cost management will determine the method to establish the budget, which includes how and if it will change and what procedures will be used to control it. Each task will have to be

estimated for cost, which means including all resources such as labor, materials, equipment, and anything else needed to complete the task.

Then comes the need to control those costs through an earned value analysis. This is performed regularly throughout the project to make sure the estimated costs are in line with actual expenditures. The three main sub-processes involved in project cost management are estimate costs, determine budget, and control costs.

#### **2.2.5.5 Project Quality Management**

A project can come in on time and within budget, but if the quality is not up to the standard set, then the project is a failure. Plan quality management is part of the overall project management plan. Through the quality assurance process, it makes sure that quality standards are being met, while through quality control, it makes sure that those standards outlined in the quality management plan are being met.

#### **2.2.5.6 Project Resource Management**

The resource management will describe how people and physical resources will be estimated, acquired, developed, managed and controlled. People are developed and managed whereas materials are controlled after they are estimated and acquired. identify their roles and their requirements for those positions, as well as how they fit in the overall project structure.

#### **2.2.5.7 Project Communications Management**

Communications inform the team and stakeholders; therefore, the need to plan communications management is a critical step in any project. The communications management plan defines who, how, and when communications will be performed and targets who needs what and when. This will also involve controlling communications by reviewing their effectiveness regularly and adjusting as needed.

### **2.2.5.8 Project Risk Management**

Risk management plans will identify how the risks will be itemized, categorized, and prioritized. This involves identifying risks that might occur during the execution of the project by making a risk register.

It includes the qualitative analysis, classification, and prioritization of risks. Then, a quantitative analysis shall be performed according to their impact on the project, such as its budget, schedule, etc.

If those risks in fact become issues, then a response needs to have been written in advance, with an owner who can make sure the risk is properly identified and handled. Controlling risks involves regularly reviewing the risk register and crossing off those risks that are no longer going to impact the project.

### **2.2.5.9 Project Procurement Management.**

Procurement management deals with outside procurement, which is part of most projects, such as hiring subcontractors. This will obviously have an impact on the budget and schedule. Planning procurement management starts by identifying the outside needs of the project and how those contractors will be involved. The procurement process is to be controlled by managing and monitoring and then closing the contracts once the work has been done to everyone's satisfaction.

### **2.2.5.10 Project Stakeholder Management**

The stakeholders' expectations must be fulfilled, as the project has been created for their needs. Therefore, they must be actively managed like any other part of the project. The plan stakeholder management includes listing each stakeholder and prioritizing what their concerns are and how they might impact the project. This will lead to managing and controlling stakeholders' expectations to make sure their needs are met and communications with them are established.

### 3. METHODOLOGICAL FRAMEWORK

#### 3.1 Information Sources

Information can come from virtually anywhere: personal experiences, books, articles, expert opinions, encyclopedias, and even in the web. Information sources are “the various means by which information is recorded for use by an individual or an organization. It is the means by which a person is informed about something or knowledge is availed to someone, a group of people or an organization. Information sources can be observations, people, speeches, documents, pictures, organizations. Information sources can be in print, non-print and electronic media or format” (Ashikuzzaman, 2018). The three types of information sources are primary, secondary, and tertiary.

#### DOCUMENTARY INFORMATION SOURCES

<b>PRIMARY</b>		<b>SECONDARY</b>		<b>TERTIARY</b>
<ul style="list-style-type: none"> <li>➤ Periodical</li> <li>➤ Research Report</li> <li>➤ Conference Proceedings</li> <li>➤ Patents</li> <li>➤ Standards</li> <li>➤ Trade Literature</li> <li>➤ Thesis</li> </ul>	<b>Condensation &amp; Repackaging</b>	<ul style="list-style-type: none"> <li>➤ Indexing Services</li> <li>➤ Abstracting Services</li> <li>➤ Review of Progress</li> <li>➤ Reference Works</li> <li>➤ Treatises</li> <li>➤ Monographs</li> <li>➤ Text Books</li> </ul>	<b>Keys and aids to search</b>	<ul style="list-style-type: none"> <li>➤ Yearbooks and Directories</li> <li>➤ Bibliographies</li> <li>➤ Location list of periodicals</li> <li>➤ List of Indexing and abstracting services</li> <li>➤ Guides</li> <li>➤ List of Research in progress</li> <li>➤ Guide to professional organizations</li> </ul>

Figure 4. Information Sources by Category. Reprinted from Library & Information Science. Ashikuzzaman, 2018.

### **3.1.1 Primary Sources**

Primary sources are firsthand documents that provide direct evidence on your topic. “Primary sources of information are the first published records of original research and development or description of new application or new interpretation of an old theme or idea. There are original documents representing unfiltered original ideas. These constitute the latest available information” (Ashikuzzaman, 2018). Examples of primary sources of information are included in Figure 5.

### **3.1.2 Secondary Sources**

“A secondary source of information is one which is neither compiled from or refer to any primary source of information. The original information having been casually modified selected or reorganized to serve a definite purpose for group of users. Due to their very nature, secondary sources are more easily and widely available than primary sources” (Ashikuzzaman, 2018). Also, a secondary source of information “is one that was created later by someone who did not experience first-hand or participate in the events or conditions you’re researching” (University of Illinois, 2006). Examples of secondary sources include bibliographies, bibliographical works, commentaries, criticisms, conference proceedings, essays or reviews, histories, and literary criticism, such as journal articles, magazine and newspaper articles, monographs, other than fiction and autobiographies, reprints of art works, and textbooks.

### **3.1.3 Tertiary Sources**

“Tertiary sources of information contain information distilled and collected from primary and secondary sources. The primary function of tertiary sources of information is to aid the searcher of information in the use of primary and secondary sources of information. Most of these sources do not contain subject knowledge” (Ashikuzzaman, 2018). Some examples of tertiary sources are almanacs, abstracts, dictionaries, encyclopedias, and handbooks.

For the purposes of this FGP, the information sources to be considered and applied are primary and secondary. Table 1 below summarizes the information sources applicable to each objective.

**Table 1 Information Sources**

Objectives	Information Sources	
	Primary	Secondary
To develop the Integration Management Plan in order to unify and coordinate the processes and project management activities.	Interviews with the AML lead project manager and other stakeholders	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To create a scope management plan to define key stakeholders' project requirements and expectations	Interviews with the AML lead project manager and stakeholders and a review of meeting minutes	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly	Interviews with the AML lead project manager and stakeholders and a review of meeting minutes	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To create a cost management plan for assigning cost to work packages, to be monitored and controlled accordingly	Interviews with the AML lead project manager and project cost control expert as well as a review of meeting minutes	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To develop a quality management plan for outlining the stakeholders' acceptance criteria to be addressed with the project execution	Interviews with the AML lead project manager and quality management lead	The PMBOK® Guide, the PMI web page (electronic templates and standards), and AML quality standard procedure



Objectives	Information Sources	
	Primary	Secondary
To create a resource management plan for assigning adequate human and physical resources to project work packages	Interviews with the AML lead project manager, with human resource manager and with project estimator	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To develop a communications management plan for clearly defining the project communication strategies	Personal interviews with the AML lead project manager	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To create a risk management plan that identifies and prioritizes risks, provides the corresponding risk response approach for the project, and identifies potential opportunities	Personal interviews with the AML lead project manager and risk management lead.	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To develop a procurement management plan for identifying and assigning the contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations	Interviews with the AML lead project manager and procurement management lead	The PMBOK® Guide and the PMI web page (electronic templates and standards)
To develop a stakeholder management plan that identifies key stakeholders, their level of interests and	Personal interviews with the AML lead project manager	The PMBOK® Guide and the PMI web page (electronic templates and standards)

Objectives	Information Sources	
	Primary	Secondary
their impact/influence on the project to ensure their engagement		

Source: López, R. (2020)

### 3.2 Research Methods

A research method can be defined as “a systematic plan for conducting research” (Moffit, K., 2019). Research methods can be classified as qualitative and quantitative. “Quantitative methods aim to classify features, count them, and create statistical models to test hypotheses and explain observations, while qualitative methods aim for a complete, detailed description of observations, including the context of events and circumstances” (Moffit, K., 2019). This FGP will be based on the qualitative research methodology, and all data collected will be aligned with the PMBOK® Guide content.

#### 3.2.1 Quantitative Research Methods

A quantitative research method gathers information through several ways, such as sampling methods, online polls, online surveys, etc.

#### 3.2.2 Qualitative Research Methods

“A qualitative research method is one where data is collected data using conversational methods, where participants involved in the research are asked open-ended questions. The responses collected are essentially non-numerical” (Bhat, A., 2019). It is also defined as “a scientific method of observation to gather non-numerical data. This type of research refers to meanings, concepts, definitions, characteristics, metaphors, symbols and description of things” (Babbie, E., 2014).

Some widely used qualitative research methods are listed below:

- Interviews: The interview technique is conducted with one participant at a given point in time.

- Focus Groups: These are small groups whose participants are usually experts in the subject matter. A moderator is assigned to a focus group who facilitates the discussion among the group members.
- Ethnographic Research: It is an in-depth form of research where people are observed in their natural environment with any alterations. Instead of conducting interviews, the researcher needs to experience the settings in person to collect information.
- Text Analysis: It is used to analyze the social life by decoding words, texts, etc., through any available form of documentation.
- Case Study Research: It is used to study an organization or an entity. This method involves a deep diving into the ongoing research and collects data.
- Data analysis is a crucial part of any research. It involves the interpretation of the data gathered through the use of analytical and logical reasoning to be able to fulfil the established objectives. There are two common ways to organize and analyze the data collected: thematic analysis and content analysis.
  - Thematic analysis groups the data into themes that will help answer the research questions. These themes may be either directly evolved from the research questions and were pre-set before data collection even began or naturally emerged from the data as or after the study was conducted. One useful method to organize data, which will be used for this FGP, will be the use of a MS Excel spreadsheet to visually and numerically highlight the problems, themes, and patterns of data obtained during the FGP process.
  - Content analysis, on the other hand, is a more mathematical organization of long stretches of text that involves coding the data for certain words or content, identifying their patterns, and interpreting their meanings.

After all the information has been gathered and organized, the expert judgment will be incorporated to the process. “Judgment provided based upon expertise in an application area, knowledge area, discipline, industry, etc. as appropriate for the activity performed.

Such expertise may be provided by any group or individual with specialized education, knowledge, experience, skill or training” (PMI, 2017, p.706)

Since the purpose of the qualitative analysis is to interpret data to facilitate the understanding of the topic being studied, this was the method selected to perform the FGP. Data will be collected by performing interviews to several project stakeholders, and then it will be observed and interpreted based on the specific objectives established in alignment with the concepts included in the PMBOK® Guide. Data will be collected, and its content will be organized and evaluated through thematic analysis along with the use of expert judgment, and it will be validated by the tutors that will provide support along the process.

The summary of research methods to be applied in this FGP is presented in Table 2, included below:

**Table 2 Research Methods**

Objectives	Qualitative Research Methods		
	Interviews	Data Organization Though Thematic Analysis	Expert Judgment Analysis
To develop the Integration Management Plan in order to unify and coordinate the processes and project management activities.	To obtain information from stakeholders regarding project requirements and any relevant detail	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.
To create a scope management plan to define key stakeholders' project	To obtain information from stakeholders regarding project	Information required/obtained will be organized in	Expert judgment analysis based on the PMBOK®

Objectives	Qualitative Research Methods		
	Interviews	Data Organization Though Thematic Analysis	Expert Judgment Analysis
requirements and expectations	requirements and any relevant detail	a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Guide concepts, knowledge, and expertise will be applied.
To create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly	To obtain information from stakeholders, including professional experts, regarding project requirements, the type of activities required and their expected duration, and any relevant detail	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.
To create a cost management plan for assigning cost to work packages, to be monitored and controlled accordingly	To obtain information from stakeholders and professional experts regarding project needs, the type of activities required, needed resources, expected	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.

Objectives	Qualitative Research Methods		
	Interviews	Data Organization Though Thematic Analysis	Expert Judgment Analysis
	costs, and any additional relevant detail	ensure the completion of the needed content	
To develop a quality management plan for outlining the stakeholders' acceptance criteria to be addressed with the project execution	To obtain information from stakeholders regarding project requirements and any relevant detail	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.
To create a resource management plan for assigning adequate human and physical resources to project work packages.	To obtain information from stakeholders regarding project requirements, the type of activities required, and human resource needs to ensure a successful execution	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.
To develop a communications management plan for clearly	To obtain information from stakeholders to be able to develop an	Information required/obtained will be organized in	Expert judgment analysis based on the PMBOK®

Objectives	Qualitative Research Methods		
	Interviews	Data Organization Though Thematic Analysis	Expert Judgment Analysis
defining the project communication strategies	adequate communications management plan	a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Guide concepts, knowledge, and expertise will be applied.
To create a risk management plan that identifies and prioritizes risks, provides the corresponding risk response approach for the project, and identifies potential opportunities	To obtain information from stakeholders and experts regarding project requirements, risks, opportunities, and any detail relevant to ensure an appropriate plan that can prioritize and manage risks as early as possible	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.
To develop a procurement management plan for identifying and assigning the contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations	To obtain information from stakeholders to define and manage contracts and all procurement processes accordingly	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.

Objectives	Qualitative Research Methods		
	Interviews	Data Organization Though Thematic Analysis	Expert Judgment Analysis
		ensure the completion of the needed content.	
To develop a stakeholder management plan that identifies key stakeholders, their level of interest, and their impact/influence on the project to ensure their engagement	To obtain information from stakeholders regarding project requirements, expectations, and any relevant detail	Information required/obtained will be organized in a MS Excel spreadsheet to visually define and highlight patterns and gaps and ensure the completion of the needed content.	Expert judgment analysis based on the PMBOK® Guide concepts, knowledge, and expertise will be applied.

Source: López, R. (2020)

### 3.3 Tools

The use of project management tools, along with the processes and techniques included in the PMBOK® Guide, supports a solid foundation for organizations to achieve their projects' goals and objectives. According to the PMBOK® Guide (2013), a tool is "something tangible, such as a template or software program, used in performing an activity to produce a product or a result" (p. 725).

Each tool to be used in the final graduation project is defined below and summarized by objective in Table 3:

- a. Project charter template: The e-Dictionary: Tech Terms defines a template as "a file that serves as a starting point for a new document". Based on that, a project



charter template is a document that will serve as a guide and base to create the project charter.

- b. Project management plan template: It will guide the creation of the project management plan and all its subcomponents.
- c. Requirement traceability matrix template: It is a document that will serve to ensure that the necessary project requirements have been identified.
- d. Work breakdown structure (WBS) online template: It is a tool that breaks down the project activities into smaller components for easier management.
- e. Requirement documentation template: It is a document that will capture the requirement documentation.
- f. Scope management plan template: It will guide the creation of the scope management plan and all its components.
- g. Schedule management plan template: It will guide the creation of the project schedule plan and its subcomponents.
- h. Activity list template: It is a document to be prepared using a Microsoft Excel 2016 tool to list all project activities.
- i. Microsoft project scheduling tool: The project schedule will be developed using the project schedule available in the Microsoft Project 2016 software.
- j. Cost management plan template: It will guide the creation of the cost management plan.
- k. Cost estimate template: Microsoft Excel Software 2016 will be used to create the project cost estimate and the corresponding calculations.
- l. Quality management plan template: It will guide the creation of the quality management plan.
- m. Quality management tools: Quality management tools help organization and collect and analyze data for employees to easily understand and interpret information. Examples of quality management tools to be applied in this project are: flow tables, graphs, check sheets, and control tables.
- n. Resource management plan template: It will guide the creation of the resource management plan.

- o. Communications management plan template: It will guide the creation of the communications management plan.
- p. Risk management plan template: It will guide the creation of the risk management plan.
- q. Risk register template: It will be created using the Microsoft Project 2017 software and Microsoft Excel Software 2017 to classify project risks, plan for them, and identify responses.
- r. Procurement management plan template: It will guide the creation of the procurement management plan.
- s. Stakeholder management plan template: It will guide the creation of the stakeholder management plan.
- t. Stakeholder engagement assessment matrix: It provides the way to detail how each stakeholder should be engaged based on their involvement in the project.

**Table 1 Tools used in the FGP**

Objectives	Tools
To develop the Integration Management Plan in order to unify and coordinate the processes and project management activities.	The project charter template and project management plan template
To create a scope management plan to define key stakeholders' project requirements and expectations	The requirement traceability matrix template, work breakdown structure template and software, and scope management plan template
To create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly	The schedule management plan template, activity list template and Microsoft Project 2017 scheduling tool
To create a cost management plan for assigning cost to work packages, to be monitored and controlled accordingly	The cost management plan template, cost estimate, and calculations with Microsoft Excel 2017

Objectives	Tools
To develop a quality management plan for outlining the stakeholders' acceptance criteria to be addressed with the project execution	The quality management plan template and several quality management tools, such as: checklists, graphs, and tables
To create a resource management plan for assigning adequate human and physical resources to project work packages	The resource management plan template and responsibility assignment matrix
To develop a communications management plan for clearly defining the project communication strategies	The communications management plan template
To create a risk management plan that identifies and prioritizes risks, provides the corresponding risk response approach for the project, and identifies potential opportunities	The risk management plan template and risk register template prepared with the use of Microsoft Excel 2017 and Microsoft Project 2017
To develop a procurement management plan for identifying and assigning the contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations	The procurement management plan template
To develop a stakeholder management plan that identifies key stakeholders, their level of interest, and their impact/influence on the project to ensure their engagement	The stakeholder management plan template, stakeholder analysis table, and stakeholder register template, using Microsoft Project 2017 and Microsoft Excel 2017

Source: Lopez, R. (2020)

### 3.4 Assumptions and Constraints

The assumptions and constraints are an essential aspect of projects. Although they are not managed like the requirements or risks, documenting them appropriately provides protection from many potential issues. An assumption is defined as “a factor in the

planning process considered to be true, real, or uncertain, without proof or demonstration” (Project Management Institute, 2017, p.699). A constraint is defined as “a limiting factor that affects the execution of a project, program, portfolio, or process” (Project Management Institute, 2017, p.701).

The assumptions and constraints considered in the final graduation project for each specific objective are summarized in Table 4, included below.

**Table 2 Assumptions and Constraints**

Objectives	Assumptions	Constraints
To develop the Integration Management Plan in order to unify and coordinate the processes and project management activities.	All the information required will be available.	There is limited time to gather all the information required to create the project charter. The availability of the project manager lead to provide the information required for this FGP is restricted.
To create a scope management plan to define key stakeholders’ project requirements and expectations	All requirements are established to develop a representative project scope. The scope management plan will include all the work required.	If any natural event occurs while planning the project, the scope may be altered.
To create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly	The time allocated for the planning and execution of the project management plan aligns with project expectations and needs.	The time defined for the RGBRP Project must not exceed 6 months.
To create a cost management plan for	The budget identified will accurately represent the	The budget identified for the RGBRP must not

<b>Objectives</b>	<b>Assumptions</b>	<b>Constraints</b>
assigning cost to work packages, to be monitored and controlled accordingly	financial resources required for a successful project.	exceed \$300,000.
To develop a quality management plan for outlining the stakeholders' acceptance criteria to be addressed with the project execution	The quality management plan will identify all the technical and quality regulatory requirements of the project.	The materials used for restoring the riverbank are not to be modified or deviated from what is established in the design.
To create a resource management plan for assigning adequate human and physical resources to project work packages	There are enough resources to execute and complete the project as required.	Only the human resources identified and planned will be accounted in the project budget.
To develop a communications management plan for clearly defining the project communication strategies	There are adequate communication channels to ensure an efficient communication with all stakeholders.	Some stakeholders may not be skilled with internet, advanced communication tools, or even with the English language.
To create a risk management plan that identifies and prioritizes risks, provides the corresponding risk response approach for the project, and identifies potential opportunities	There is enough information to adequately identify the principal/critical project risks.	All principal risks must be identified within the planning phase or at the earliest.
To develop a procurement management plan for identifying and assigning the	There is a list of approved suppliers available to the project.	The selected contractor must prove to have experience in this type of

Objectives	Assumptions	Constraints
contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations		project and will need to provide proof of insurance certification.
To develop a stakeholder management plan that identifies key stakeholders, their level of interest, and their impact/influence on the project to ensure their engagement	Information of all stakeholders is available.	The information required to plan and manage all stakeholders must be accurate.

Source: Lopez, R. (2020)

### 3.3 Deliverables

A deliverable is defined in the PMBOK® Guide 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” (Project Management Institute, 2017, p.4).

**Table 3 Deliverables**

Objectives	Deliverables
To develop the integration management plan in order to unify and coordinate the processes and project management activities.	Project Charter
To create a scope management plan to define key stakeholders' project requirements and expectations	Scope Management Plan
To create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly	Schedule Management Plan

Objectives	Deliverables
To create a cost management plan for assigning cost to work packages, to be monitored and controlled accordingly	Cost Management Plan
To develop a quality management plan for outlining the stakeholders' acceptance criteria to be addressed with the project execution	Quality Management Plan
To create a resource management plan for assigning adequate human and physical resources to project work packages	Resource Management Plan
To develop a communications management plan for clearly defining the project communication strategies	Communications Management Plan
To create a risk management plan that identifies and prioritizes risks, provides the corresponding risk response approach for the project, and identifies potential opportunities	Risk Management Plan
To develop a procurement management plan for identifying and assigning the contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations	Procurement Management Plan
To develop a stakeholder management plan that identifies key stakeholders, their level of interest, and their impact/influence on the project to ensure their engagement	Stakeholder Management Plan

Source: López, R. (2020)

## **4. RESULTS**

### **4.1 Project Integration Management**

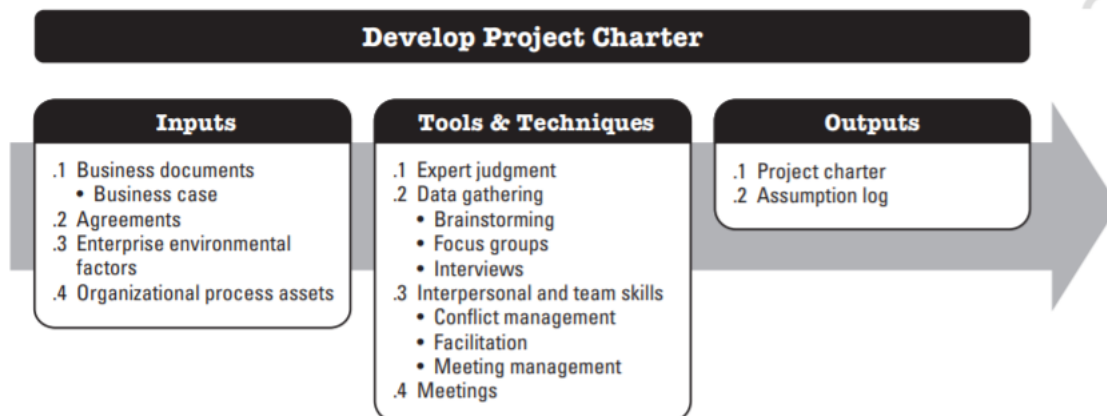
#### **4.1.1 Introduction**

There were several objectives as part of the project management plan for the Rio Gurabo Bank Restoration Project. The first objective of the RGBRP is to develop a project integration management process to unify and coordinate all project activities. The scope of an integrated project management plan includes: to develop the project charter, to develop the project management plan, to direct and manage project work, to monitor and control project work, to perform integrated change control and to close project. The creation of a project charter to formally authorize the project and provide the project manager with the authority to apply organizational resources to the project to produce the project management plan. The project charter is created with the information that resulted from the use of interviews, a review of the project meeting minutes, the use of PMBOK® Guide sources, and PMI database templates. All the information obtained to prepare the project charter and the project management plan was gathered and examined through an analytical research methodology.

#### **4.1.2 Project Charter**

The project charter consisted of the project purpose, objectives, description, high-level risks, stakeholder list, high-level requirements, assumptions and constraints, identification of deliverables, summary of milestone schedule, overall project budget, criteria necessary of the project approval, identification of the project manager, and the sponsor's authorization. (PMI, 2017, p75). The RBGR project charter was based on the inputs, tools, and techniques supported by the PMBOK® Guide and specified in Figure 6.





**Figure 5. Develop Project Charter** Reprinted from PMBOK® Guide 2017.

Since AML has never supported a project management approach to deliver its “expense projects”, it was confirmed, during the data gathering process that all documents and processes defined by PMI as inputs, tools, and techniques for the project integration management were missing or never prepared. To gather the required information, several interviews were conducted with the project manager, Engineer Francisco Quiles and with the project designer, Engineer Rafael Rosas, along with a review of the meeting minutes available. The project charter prepared for the Gurabo Riverbank Restoration Project is included as Table 6.

**Table 4 RBGRP Project Charter**

General Project Information	
Project Name:	River Bank Gurabo Restoration Project (RBGRP)
Project Location:	Rio Gurabo, Juncos, Puerto Rico
Sponsor:	Rayne Waller, Amgen VP
Project Manager:	Eng. Francisco Quiles
Project Purpose / Business Justification	
RBGRP was a structural control designed and constructed in 2010 to stabilize a Gurabo river left bank segment of approximately 300 meters. The structural control included the installation of (7) seven rock vanes (RV) to redirect the erosive forces from the river	

bank toward the center of the channel and the construction of a rock bench which served as an adequate structure to tie in the rock vanes and provide additional protection to the bank toe. Extensive Gurabo River channel erosion was observed after flooding events caused by hurricane Maria on September 20, 2017. This new RGBR project will return the riverbank its stability while protecting the AML surrounding facilities and community. In the current conditions, any flooding disruption in the area can result in a threat to the AML business operations and also in safe conditions for the nearby community. The project can indirectly reduce future costs of possible flood damages in the area.

### **Project Scope Statement**

The RBGR Project proposes to restore a small segment of the rock bench that was previously installed in 2010 to stabilize and control the erosion problems on the Gurabo River. As a result of Hurricane Maria, approximately 350 meters, between the rock vanes #4 and # 5, were undermined during the flood. In addition, the upper stone installed at the end of the rock vane (in the elevation of the riverbed) dislodged to the side downstream of the rock vane.

### **Objectives**

By restoring the damaged portion of the Gurabo riverbank, the probability of erosion occurrence during heavy rain events will reduce and the existing area unsafe conditions will dramatically decrease. The RBGR Project specific objectives are:

To complete all applicable permitting processes required prior, during, and after the project activities

1. To obtain a project design validated by a professional engineer or architect that includes the construction of a new rock vane (RV) at the rock bench segment undermined to be identified as rock vane #9 and the reconstruction of rock vanes #4 and #5

The confirmation of the successful execution of the project with certified inspection reports

<b>Project Final Deliverables</b>
<p>The project aims to restore 300 meters of damaged riverbank by installing 1.5-meter tall rocks into the affected riverbank as indicated in the specifications prepared by the designer. The project deliverables include:</p> <p>Drawings and specifications stamped by a professional engineer and approved by the permitting agencies</p> <p>Weekly certified inspections performed and provided by the professional engineer</p> <p>Final inspection report certified by a professional engineer responsible for the project inspections, confirming that the project activities followed all drawings and specification requirements</p> <p>Approved permitting documents for construction and use</p>
<b>Summary of Milestones</b>
<ul style="list-style-type: none"> <li>- Drawings and specification completion</li> <li>- Construction permitting process approval</li> <li>- Contractor selection</li> <li>- Material selection, acceptance, and delivery into the site</li> <li>- Riverbank stabilization completion validation by project inspector</li> <li>- Final permitting documentation for closeout</li> <li>- Contracts' closeout</li> </ul>
<b>Major Known Risks</b>
<p>1. Financial issues:</p> <ul style="list-style-type: none"> <li>- Damage of materials onsite</li> <li>- Underestimation of project</li> <li>Robbery of materials in the area</li> </ul>
<p>2. Compliance issues:</p> <ul style="list-style-type: none"> <li>- Construction activities are not consistent with required specifications</li> <li>- Archeological findings that can make the project stop</li> <li>- Occurrence of a spill/contamination event</li> </ul>

3. Schedule delays:

- Weather: storms, heavy rain events, and/or flooding events that can delay the project
- Permitting approval delay
- Material unavailability
- Equipment failure

4. Safety incident situation :

Accident

5. Community issues:

- Unauthorized entrance into project area
- Community opposition to the project

**Constraints**

The project budget should not exceed \$ 300,000, which is the funding assigned by the insurance. The project construction phase must take place during the months of January to May 2019 to ensure avoiding hurricane season, which starts in June 1. In addition, as soon as works get started, they need to be completed within 8 weeks to ensure achieving the structural stabilization of the area, as per design.

**Assumptions:**

A. Schedule:

- It is assumed that there will be no flooding events during the project execution.
- It is assumed that the required material will be available and will fully comply with design specifications.
- It is assumed that all permits will be approved on time and with no further restrictions to ensure that the construction execution can take place within January and May.
- It is assumed that the project execution will be completed within the months of January and May.

<p>B. Finances</p> <ul style="list-style-type: none"> <li>- It is assumed that the funds required are available.</li> </ul> <p>C. Work force:</p> <ul style="list-style-type: none"> <li>- It is assumed that the contractors are experienced and available for performing the tasks required.</li> </ul>			
<b>Stakeholders</b>			
AML VP – (sponsor)			
Rafael Rosa (designer)			
AML project manager			
Project control specialist			
Permitting expert			
LP Construction (general contractor)			
Construction inspector			
Safety officer			
Supplier- Gravel			
Consultants: geotechnical engineer			
Environmental and permitting agencies			
- Environmental Quality Board			
- Department of Natural and Environmental Resources			
- US Corps of Engineers			
- Environmental Protection Agency			
- US Fish and Wild Life			
- OGPe (PR Permitting Agency)			
Juncos community			
AML employees			
<b>Sign-off</b>			
Project charter approved by:			
<i>Responsible</i>	<i>Name</i>	<i>Signature</i>	<i>Date (MM/DD/YYYY)</i>

Sponsor	R. Waller		
Project Manager	F. Quiles		

Source: López, R. (2020)

Assumptions were included as part of the project charter, but since the assumption log is used to record all assumptions and constraints throughout the project lifecycle (PMI, 2017, 81), an assumption log template was included as a reference as Table 7.

**Table 5 Assumption Log Template**

<b>Project Name</b>						
<b>Project Number</b>				<b>Document Number</b>		
<b>Project Manager</b>				<b>Project Owner/Client</b>		
<b>Assumption #</b>	<b>Date</b>	<b>Assumption</b>	<b>Validation Assigned To:</b>	<b>Validation Due Date:</b>	<b>Assumption Valid (Y/N)</b>	<b>Status/ Comment</b>

Source: López, R. (2020)

#### **4.1.3 Create Project Management Plan**

The creation of the project management plan involves defining, preparing, and coordinating all plan components and consolidating them into as an integrated project management process (PMBOK, 2017, 553).

#### **4.1.4 Direct and manage project work**

Direct and manage project work is the process of leading and performing the work defined in the project management plan and implementing approved changes to achieve the project's objective.

#### **4.1.5 Manage project knowledge**

Manage project knowledge is the process of using existing knowledge to achieve the project's objectives and contribute to organizational learning. The lessons learned

documentation is knowledge gained throughout the project and recorded using tools such as a lessons learned template. The purpose of the lessons learned is improved performance. Such learnt lessons will be reviewed and added to the AML projects' lessons learned database. Recording learnt lessons is an ongoing process throughout the entire project life cycle. Recommended lessons learned meetings frequency are included in the communication management plan. The RGBRP lesson learned will be recorded in a template included as Appendix 4.

#### **4.1.6 Monitor and Control Project work**

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

#### **4.1.7 Perform Integrated Change Control**

Project change control ensures that no unauthorized changes are made to a product, service or process, and that approved changes are made to the agreed extent and in the agreed manner. All plans complementing the RGBR project management plan incorporate the change control management processes to avoid unnecessary changes and to document, evaluate and agree on changes implementation, as needed throughout the project life cycle.

#### **4.1.6 Close Project or Phase**

The post project review is summary and comparison of the original demands of the project and the project actual results. A post project review will be performed every time a phase gate is reached, and the project moves from one phase to the next. The post project review is focused on: baselines, customer satisfaction, organization's critical success factors and opportunities. The post project review process is to be managed by the project manager to be held at the completion of each phase and at the end of the project. A post review process template was included as Appendix 5.

## **4.2. Scope Management Plan**

### **4.2.1 Introduction**

The RGBRP was planned to mitigate and restore a critical situation caused by Hurricane Maria. As a result of the hurricane, unprecedented flood events perturbed the Gurabo riverbank, increasing erosion conditions exponentially. This project is to be managed adequately to fulfill all requirements that ensure the stabilization of the riverbank.

This scope management plan will ensure that the project includes all tasks required to complete the RGBRP and how the scope will be defined, validated, and controlled as indicated in the PMBOK® Guide. The scope management plan was created using a template taken from an online source and prepared using the input received from the project charter, meetings, data analysis, and expert judgment. It includes the scope definition, project scope statement, the work breakdown structure (WBS), WBS dictionary, scope verification, and the scope control measures to be used as guidance by the project management team throughout the project.

#### **4.2.1.1 Approach**

The AML project manager will be responsible for the scope management plan development. The scope statement and the work breakdown structure will define the scope of the project.

#### **4.2.1.2 Roles and Responsibilities**

The project manager, sponsor, and the project team will play different roles in managing the scope of the project. To ensure that the project scope is performed as established, the roles and responsibilities are to be defined and communicated. The table below identifies the key stakeholders and their roles and responsibilities towards the scope management plan of this project.



**Table 6 Scope Management Roles and Responsibilities**

Name	Role	Responsibility
<b>R. Waller, AML VP</b>	Project Sponsor	<ul style="list-style-type: none"> <li>• Approves scope management plan</li> <li>• Provides high-level scope definition</li> <li>• Reviews escalated scope issues and provides direction for resolution</li> <li>• Approves major scope change requests</li> </ul>
<b>F. Quiles</b>	Project Manager	<ul style="list-style-type: none"> <li>• Has overall responsibility for scope management</li> <li>• Oversees the development of the scope management plan</li> <li>• Oversees the scope change management process</li> <li>• Approves scope change requests within his authority</li> <li>• Escalates scope and change issues</li> <li>• Ensures that scope changes are incorporated into appropriate project documents</li> </ul>
<b>Amgen Procurement Manager</b>	Contract Manager	<ul style="list-style-type: none"> <li>• May have a role in deliverable verification and acceptance when the deliverable is required under contract terms</li> </ul>
<b>Project Team</b>	Project Team	<ul style="list-style-type: none"> <li>• Help develop the project scope statement</li> <li>• Submit scope change requests</li> <li>• Review scope change requests when assigned</li> <li>• Provide feedback as and when required</li> <li>• Participate in team-level scope change reviews</li> </ul>
<b>Consultants</b>	Subject Matter Experts (SMEs)	

Name	Role	Responsibility
<b>Designated Inspector</b>	Project Inspector	<ul style="list-style-type: none"> <li>• Provides an ongoing independent review and analysis of project scope management practices</li> <li>• Monitors scope changes and provides feedback</li> <li>• Confirms/certifies scope execution in the field</li> </ul>
<b>LP Construction</b>	Contractor	<ul style="list-style-type: none"> <li>• Will follow scope requirements</li> </ul>

Source: López, R. (2019)

## 4.2.2 Scope Management Processes

### 4.2.2.1 Definition of Scope

The RGBRP will result in the stabilization of the Gurabo riverbank. It will reduce/control erosion and will provide safety for the Juncos community and AML's facilities in case of an extensive rain/flood event. The scope for this project was defined through an analytical requirement collection process, since the project lacked information and documentation. First, a thorough analysis of all revised project contracts and meeting minutes, building codes, owners' requirements, and documentation relative to industry standards was completed to gather the information in the requirement traceability matrix. This matrix is included as table 9 and provides a way to identify its requirement by level of priority and provides an understanding of the expected deliverables and the verification methods.

**Table 7 RBGRP Requirement Traceability Matrix**

<b>Project Manager:</b>	<b>F. Quiles</b>			<b>Project : Gurabo Restoration River Bank</b>		
<b>Sponsor:</b>	R. Waler					
<b>INFORMATION REQUIREMENTS</b>				<b>RELATIONSHIP TRACEABILITY</b>		
<b>ID</b>	<b>CATEGORY (Mandatory Y/N)</b>	<b>REQUIREMENT</b>	<b>PRIORITY (Low/Medium/High)</b>	<b>BUSINESS OBJECTIVE</b>	<b>DELIVERABLE</b>	<b>VERIFICATION</b>
<b>REQ-001</b>	Y	Project design complies with construction codes and regulations.	High	Commitment to 100% compliance with standards and codes	Permits, approvals, and inspector reports	Monthly inspector certification with 100% compliance reporting
<b>REQ-002</b>	Y	The size of the rocks is to be from 1.3-1.5 meters	High	Commitment to 100% compliance with standards and codes	Inspector report certifying the size of the rocks	Inspection and certification as material enters the site or as required

Source: López, R. (2020)

The project deliverables resulted from the input of the requirement collection process and the information received from subject matter experts, such as the designer, environmental/regulatory agencies, project manager, and general contractor. This process of expert judgement provided feedback on the most effective, safe, and cost-efficient ways to meet the required stabilization of the riverbank. To create the scope management plan, the project charter was used as input, along with an interview which was conducted with the lead project manager (Eng. Quiles) and designer and the review of the meeting minutes.

#### **4.2.2.2 Project Scope Statement**

In the year 2010, a riverbank restoration project was performed in that area. Those project results were able to control the erosion until September 20, 2017, when the major flooding events caused by Hurricane Maria a segment of the rock bench. In

summary, the proposed project for the Rio Gurabo Bank Stabilization (RGRBP) will complete the following activities:

- Complete the permitting process required for the planning, execution, and final closeout of the project.
- Selection of the specific material (rocks) to be installed in the riverbank
- Construction of a new rock vane at the rock bench segment
- Placement and installation of the top stone dislodged within rock vanes #4 and #5
- Complete the final inspections and final permits

#### **4.2.2.2.1 Project Exclusions**

RGRBP is focused on repairing the rock benches identified as #4 and #5 and constructing a new rock vane (to be identified as #9). Any additional restoration of rock benches different from the ones identified are not part of the scope of work.

#### **4.2.2.2.2 Project Constraints**

The project is funded by insurance policy funds granted to a top amount of \$300,000. The project is to be executed within January 1 and May 30, to avoid working in the hurricane season. In addition, as soon as construction works start execution, activities are to be completed within 8 weeks to ensure achieving the structural stabilization of the area, as per design.

#### **4.2.2.2.3 Project Assumptions**

It is assumed that the project scope has been correctly identified and no additional modifications are needed.

#### **4.2.2.2.4 Acceptance Criteria**

The project success is the intended result of a project and what is required to bring it to completion. To get a real measure of your project's success you want to determine if it achieved its objectives within the given framework. The success of RGRBP will be realized once:

- The professional inspector confirms that the project followed all specifications indicated in the project design
- All permits are approved on time
- The project does not exceed the \$300,000.00 funds assigned
- The project execution itinerary indicated to be within January 1 to May 31 was is not altered

#### **4.2.2.3 WBS and WBS Dictionary**

This section contains the work breakdown structure (WBS) and its related information. The WBS and WBS Dictionary are important components of effective scope management. The WBS for the RGBRP provides the hierarchical decomposition of the total scope of work to be carried out in fulfillment of the objectives of the project. Decomposition techniques were applied in this process with the assistance of the project designer, who has vast experience in this type of projects and who was responsible for the previous project performed in 2010 in the same area. The RGBRP activities were subdivided into individual work packages to allow the project manager to manage the project's scope more effectively as the project team works on the tasks necessary for project completion. Project scope requirements were included in the WBS (Figure 7).

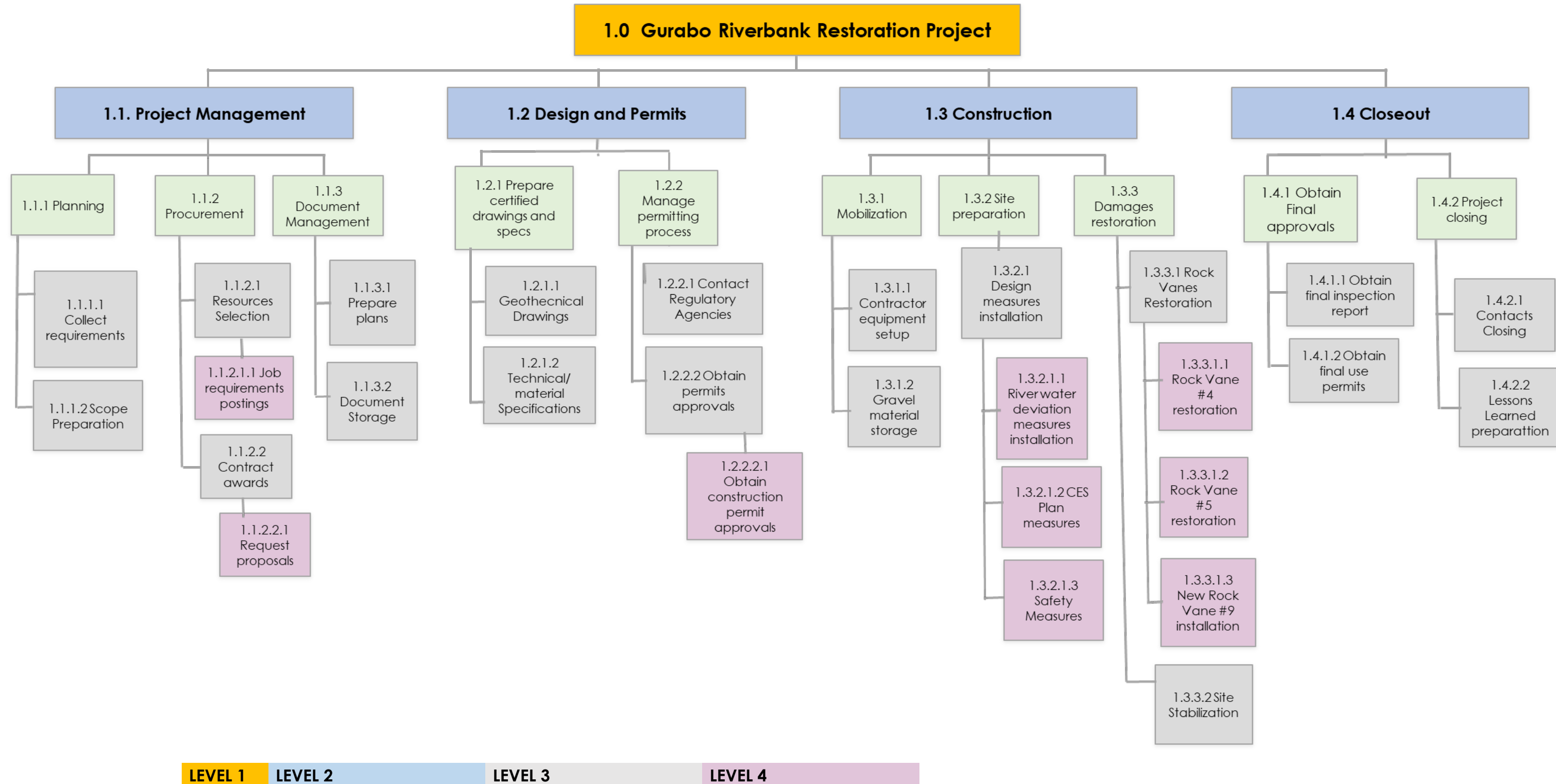


Figure 6. RBGRP WBS. Source: R. López, (2019)

To define the work necessary for project completion more clearly, the WBS Dictionary is used. The WBS Dictionary includes an entry for each WBS element. The WBS Dictionary includes a detailed description of work for each element and the general deliverables.

**Table 8 WBS Dictionary**

<b>Level</b>	<b>WBS Code</b>	<b>Element Name</b>	<b>WBS Description</b>
1	1.1	Project Management	Commencement of the project planning phase and decision making
2	1.1.1	Project Planning	Gather all information and requirements for planning purposes
3	1.1.1.1	Collect Requirements	Meetings held to ascertain project requirements based on sponsors' and stakeholders' feedback
4	1.1.1.2	Initial Scope Preparation	Analysis of information obtained
2	1.1.2	Procurement	Contract/award processes
3	1.1.2.1	Resource Selection	Select resources needed as project support
4	1.1.2.1.1	Post Project Resource Job requirements	Post project resource job requirements
3	1.1.2.2	Contract's Awards	Select suppliers and a construction contractor firm
4	1.1.2.2.1	Request Proposals	Request proposals for the construction activities proposed
2	1.1.3	Document Management	Hardcopy and electronic file preparation
1	1.2	Design and Permits	Project specific design and the corresponding permitting process for construction
2	1.2.1	Certified Drawings and specifications	Review and approve certified drawings and specifications provided by the designer

2	1.2.2	Manage Permits	Manage the permitting strategy and prepare and submit all permitting documentation
3	1.2.2.1	Regulatory Agencies	Meet with regulatory agencies to define permitting strategy and/or clarify doubts
4	1.2.2.2	Obtain Permits and Endorsement Approvals	Follow up process to obtain permit approval as scheduled
1	1.3	Construction	Project execution
2	1.3.1	Mobilization	Contractors' equipment and temporary offices storage/location in project area
2	1.3.2	Site Preparation	Earthcrust preparation/movement as identified in grading plan/drawing
3	1.3.2.1	Installation of Design Measures	There are several measures/conditions to be installed as pre-construction requirements.
4	1.3.2.1.1	Installation of River Deviation Measures	River current will need to be deviated as per design to allow the execution of riverbank construction activities.
4	1.3.2.1.2	CES Plan Measures	Erosion control measures are to be installed as per design.
4	1.3.2.1.3	Installation of Safety Measures	Safety measures are to be installed as per design.
2	1.3.3	Damage Restoration	Riverbank damage restoration as per design
3	1.3.3.1	Rock Vane Restoration	Rock vane restoration as per design
4	1.3.3.1.1	Rock Vane #4 Restoration	Rock vane #4 restoration as per design
4	1.3.3.1.2	Rock Vane #5 Restoration	Rock vane #5 restoration as per design



4	1.3.3.1.3	New Rock Vane Construction #9	New rock vane construction #9 as per design
4	1.3.3.1.4	Site Stabilization and Material Removal	Site stabilization and material removal
1	1.4	Closeout	Contracts closing, payments performed, and final documentation approved
2	1.4.1	Final Approvals	Final documentation approved
3	1.4.1.1	Obtain Final Inspection Report	Inspector will validate in the field that all construction works were completed and will certify it in a report.
3	1.4.1.2	Obtain Final Use Permits	Final approval for use/project completion
2	1.4.2	Project Closing	Contracts' closing and invoice payment
3	1.4.2.1	Contracts' Closing	Ensure all contracts are closed
3	1.4.2.2	Lessons Learned	Meet and gather lessons learned from project execution

**Source: López, R. (2020)**

#### **4.2.3 Scope Change**

Any project team member can request project scope changes by completing a change request form (Table 11) and submitting it to the project manager for his evaluation. For this project, the possibilities of change request approvals related to the project scope are very limited due to the time and budget constraints. Change requests must be justified only if they are critical activities affecting safety or compliance in the project. If the change request is approved by the project manager, he will present it to the project sponsor to obtain the final approval. Once granted, the PM will communicate the scope change to the stakeholders and will update all related documents. A change request form template with the recommended queries is included as table 11.

Table 9 Change Request Form Template

Change Request Form	
<b>Project: River Bank Gurabo Restoration Project</b>	Date:
<b>Change Requestor:</b>	Change No:
<b>Change Category (Check all that apply):</b> <input type="checkbox"/> Schedule <input type="checkbox"/> Cost <input type="checkbox"/> Scope <input type="checkbox"/> Requirements/Deliverables <input type="checkbox"/> Testing/Quality <input type="checkbox"/> Resources	
<b>Does this change affect (check all applicable):</b> <input type="checkbox"/> Corrective action <input type="checkbox"/> Preventative action <input type="checkbox"/> Defect repair <input type="checkbox"/> Updates <input type="checkbox"/> Other	
<b>Describe the change being requested:</b>	
<b>Describe the reason for the change:</b>	
<b>Describe all alternatives considered:</b>	
<b>Describe any technical changes required to implement this change:</b>	
<b>Describe risks to be considered for this change:</b>	
<b>Estimate resources and costs needed to implement this change:</b>	
<b>Describe the implications to quality:</b>	
<b>Disposition:</b> <input type="checkbox"/> Approve <input type="checkbox"/> Reject <input type="checkbox"/> Defer	
<b>Justification of approval, rejection, or deferral:</b>	

Approval:		
Name	Signature	Date
<b>Project Manager</b>		
<b>Sponsor</b>		

Source: López, R. (2019)

#### 4.2.4 Scope Control

The project manager will be controlling the scope of work through inspections and continuous status meetings (at least once a week). The team will perform the work reflected on the WBS and the WBS Dictionary. The project manager will review weekly

progress reports to ensure project works are progressing as planned. Project scope measurement tools will be used as part of the variance analysis process to ascertain project compliance and matters that need addressing.

#### 4.2.5 Scope Verification

In this section, deliverables will be verified for formal acceptance through a series of periodic scheduled meetings between the project manager, inspector, sponsor, designer, and other team members. During that interaction, group decision-making techniques will be utilized at every inspection of project deliverables throughout the life of the project. As the project progresses, the project manager will verify project deliverables against the original scope. The project manager will grant provisional acceptance to individual deliverables submitted for review once each is satisfactorily attempted. The project manager then engages in subsequent deliberations with the project sponsor who ultimately provides formal acceptance for each deliverable. Once approved, the project sponsor and project manager sign off on the project deliverable acceptance document (Table 12). Items that do not meet specifications are returned to the team to be addressed and reported back to the project manager. The quality management plan provides thresholds and complementary information to be used in the acceptance process and to be documented in the project deliverable acceptance form.

**Table 10 Project Deliverable Acceptance**

<b>Project Title:</b>	<b>Restoration Gurabo Bank River Project</b>
<b>Deliverable Name</b>	Description of the deliverable to be accepted
<b>Acceptance Criteria</b>	Provide the criteria against which the deliverable will be judged (refer to quality management plan for details)
<b>Verification Method</b>	
<b>Validation Method</b>	
<b>Client Name</b>	
<b>Client Signature</b>	

<b>Project Title:</b>	<b>Restoration Gurabo Bank River Project</b>
<b>Signature Date</b>	YYYY-MM-DD

Source: Lopez, R. (2020)

#### 4.2.6 Plan Approval

This scope management plan has been reviewed and approved by:

<b>Approver Name</b>	<b>Title</b>	<b>Signature</b>	<b>Date</b>
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

#### Revision History

<b>Version</b>	<b>Date</b>	<b>Reason</b>	<b>Executive Sponsor Sign Off</b>

### 4.3 Schedule Management Plan

#### 4.3.1 Introduction

The RGBRP schedule management plan process is based on PMBOK® guidance to define the approach the project team will use in creating and managing the project schedule throughout the project lifecycle. This plan also includes how the team will monitor the project schedule and manage changes after the baseline schedule has been approved. This particular project is time sensitive, since it needs to be completed outside the hurricane season, making the execution of the project only possible within the period of January 1 to May 31. In addition, as soon as the work starts, it needs to be completed within 8 weeks to ensure achieving the structural stabilization of the area, as per design.

#### 4.3.1.1 Schedule Management Approach

The purpose of this schedule management plan is to establish the criteria and the activities for developing, monitoring, and controlling the project schedule. No schedule changes will be permitted unless a request for change is processed in accordance with the procedures set forth in the change management plan. The project manager will assume overall responsibility for schedule management.

#### 4.3.2 Roles and Responsibilities

Roles and responsibilities for schedule development are identified in the table 13.

**Table 11 Schedule Management Roles and Responsibilities**

Names / Roles	Responsibilities
<b>Project Manager- Francisco Quiles</b>	The project manager will be responsible for facilitating work package definition and sequencing and estimating duration and resources with the project team. The project manager will obtain schedule approval from the project sponsor and baseline the schedule.
<b>Project Sponsor</b>	The project sponsor will validate the schedule along with the project team and project manager.  The project sponsor will participate in reviews of the proposed schedule and approve the final schedule before it is baselined.
<b>Project Team Members</b>	They prepare all required documentation to complement the schedule management.  They will participate in reviews of the proposed schedule and assist in its validation.
<b>Project Scheduler</b>	The project scheduler will create the project schedule using MS Project 2017 and will validate the schedule with the project team, stakeholders, project manager, contractor, and project sponsor.
<b>Contractor -LP Construction</b>	It will be responsible for constructing in accordance to the schedule.

Names / Roles	Responsibilities
<b>Design Firm</b>	It will be responsible for preparing a design in accordance with construction codes and environmental regulations within the time specified to ensure corresponding approvals (permits) are obtained accordingly.
<b>Government Agencies</b>	To approve permits/endorsements on a timely manner

Source: López, R. (2020)

### 4.3.3 Scheduling Method

The scheduling method defines the framework and algorithms used in the scheduling tool to create the schedule model. The scheduling method used for the project will be the critical path method (CPM). The critical path method calculates the minimum project duration and determines the amount of scheduling flexibility on the logical network paths within the schedule model. In order to understand the critical path method calculations, the following definitions are to be understood:

- **The Earliest Starting time (EST):** The earliest starting time is the date on which an activity can start the earliest. It depends on the longest chain of activities that leads to the start of this activity.
- **The Earliest Finishing time (EFT):** The date on which an activity can end the earliest.
- **The Latest Starting time (LST):** The date on which an activity must start the latest in order to maintain the ending time of the whole project.
- **The Latest Finishing time (LFT):** The date on which an activity must have been completed in order to maintain the ending time of the whole project.
- **Slack:** is the amount of time that a task can be delayed without affecting the deadlines of other subsequent tasks (LFT-EFT)

**Table 12 Critical Path Method Determination**

ACTIVITY	DESCRIPTION	TIME (DAYS)	EST	EFT	LST	LFT	SLACK	CRITICAL
1.1.1	Project Planning	30	0	30	5	35	5	
1.1.2	Procurement	21	30	61	81	69	8	
1.1.3	Document Management	293	0	293	71	364	71	
1.2.1	Certified Drawings and Specifications	30	30	60	40	80	20	
1.2.2	Manage Permits	70	60	130	81	130	0	**
1.3.1	Mobilization	4	131	135	140	154	19	
1.3.2	Site Preparation	10	136	146	155	165	19	
1.3.3	Damage Restoration	26	147	173	166	192	19	
1.4.1	Final Approvals	16	173	189	193	209	20	
1.4.2	Project Closing	15	190	205	210	225	20	

Source: López, R. (2020)

#### 4.3.3.1 Scheduling Tool

Project schedules will be created using MS Project 2017, starting with the deliverables identified in the project's work breakdown structure (WBS). Activity definition will identify the specific work packages which must be performed to complete each deliverable. Activity sequencing will be used to determine the order of work packages and assign relationships between project activities. Activity duration estimating will be used to calculate the number of work periods required to complete work packages. Through resource estimating, the assignation of resources to the corresponding work packages is to be performed. Once the schedule is developed, the project's sponsor will approve it and it will then be baselined. Only the scheduler and the project manager will have access to edit the schedule.

#### 4.3.4 Schedule Processes

The project scheduler will initiate schedule development with the input of the project work breakdown structure (WBS). The WBS can be found in the scope management plan. Expert judgment and lessons learned are to be used to create the project schedule.

#### 4.3.4.1 Define and Sequencing Activities

Defining activities refers to the process of identifying and documenting the specific actions to be performed to produce the project deliverables. Sequencing activities is the process of identifying and documenting relationships among the project activities. The work breakdown structure (WBS) found in the scope management plan was used to prepare the activity list.

**Table 13 Activity List**

#	WBS Code	Element Name	Duration (days)	Predecessor	Successor
1	1.1.1	Project planning	30	n/a	2
2	1.1.2	Procurement	21	4	5
3	1.1.3	Document Management	45	1	2,4,5,6,7,8,9,10
4	1.2.1	Certified drawings and Specifications	20	1,2,3	5
5	1.2.2	Manage permits	70	2,3,4	6
6	1.3.1	Mobilization	4	5	7
7	1.3.2	Site preparation	10	5,6	8
8	1.3.3	Damage Restoration	26	5,6,7	9
9	1.4.1	Final approvals	16	8	10
10	1.4.2	Project closing	15	9	n/a

Source: López, R. (2020)

#### 4.3.4.2 Estimate Activity Resources

Activity resources were estimated using information from previous projects and with the input obtained from the expert judgment of the scheduler, project manager, and other team members.



**Table 14 Activity Resources**

#	Coding	Activity Name	Milestones	Brief Description	Required Human Resources
1	1.1.1	Project Planning	Project charter and project management plan	Formal acceptance is to be signed to start the proposed project. All project management planning processes are to be evaluated, prepared, and reviewed to ensure project success.	Project manager, subject matter experts, and legal
2	1.1.2	Procurement	Request for proposal documentation preparation and bidding process completion	Bidding process and contracts' awards	Legal, procurement, and project manager
3	1.1.3	Document Management	Approved certified drawings file, approved construction permits file, use permits file, and certified inspector reports file	Document gathering and standard location in the project shared folder	Project manager and one (1) additional resource
4	1.2.1	Certified Drawings and Specifications	30% drawings review and acceptance, 60% drawings review and acceptance, and 100% drawings	Drawings and specifications necessary to fulfill sponsor expectations and to be able to submit the	Design firm (subject matter experts)

#	Coding	Activity Name	Milestones	Brief Description	Required Human Resources
			review and acceptance	corresponding permits to start construction	
5	1.2.2	Manage Permits	Construction permit approvals and use permit approvals	All processes required to submit and obtain the permit approval for starting construction	Permitting expert and inspector
6	1.3.1	Mobilization	Inspector report confirming equipment/office location installation as per design	Contractor equipment and office storage location in project area	Three (3) contractors, one (1) inspector, project inspector, one (1) project coordinator, and one (1) safety inspector
7	1.3.2	Site Preparation	Inspector report confirming site preparation execution as per design	Pre-construction site preparation as per drawings	Eight (8) contractors, a safety inspector, a scheduler, and a construction inspector
8	1.3.3	Damage Restoration	Weekly inspector reports confirming construction as per design	Foundations required for the house	Contractors (15-20), a safety inspector, a project coordinator, a project scheduler, and a construction inspector
9	1.4.1	Final Approvals	Final construction	Concrete slabs required as part	(8) contractors, a safety inspector, a

#	Coding	Activity Name	Milestones	Brief Description	Required Human Resources
			report certifying construction completion and final use permit approval	of the house construction	construction inspector, a permitting expert, and a project manager
10	1.4.2	Project Closing	Final sponsor acceptance contracts' closing	Punch list completion and final approval contracts' closing certification and final sponsor acceptance	Project coordinator, project scheduler, procurement professional, project inspector, and project manager

Source: López, R. (2020)

#### 4.3.5 Develop Schedule

Developing the project schedule involves analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model. The project scheduler, project manager, sponsor, and other project team members will provide feedback to ensure the durations established are accurate.

**Table 15 Rio Gurabo Bank Restoration Proposed Project Duration**

WBS#	Start Day	End Date	Duration
1.1.1	9/1/2019	10/1/2019	30
1.1.2	10/31/2019	12/19/2019	49
1.1.3	6/1/2019	3/20/2020	293
1.2.1	10/1/2019	10/31/2019	30
1.2.2	10/31/2019	1/9/2020	70
1.3.1	1/9/2020	1/13/2020	4

<b>WBS#</b>	<b>Start Day</b>	<b>End Date</b>	<b>Duration</b>
<b>1.3.2</b>	1/13/2020	1/23/2020	10
<b>1.3.3</b>	1/23/2020	2/18/2020	26
<b>1.4.1</b>	2/18/2020	3/5/2020	16
<b>1.4.2</b>	3/5/2020	3/20/2020	15

Source: López, R., (2020)

#### **4.3.6 Schedule Baseline**

RGPBP schedule model (baseline) will be prepared in a Gantt table including the expected duration times, starting date, and end date. It is critical that activities included in the construction phase which are identified as 1.3.1 through 1.3.3 are performed anytime between January 1 to May 31 with a length no longer than eight weeks.

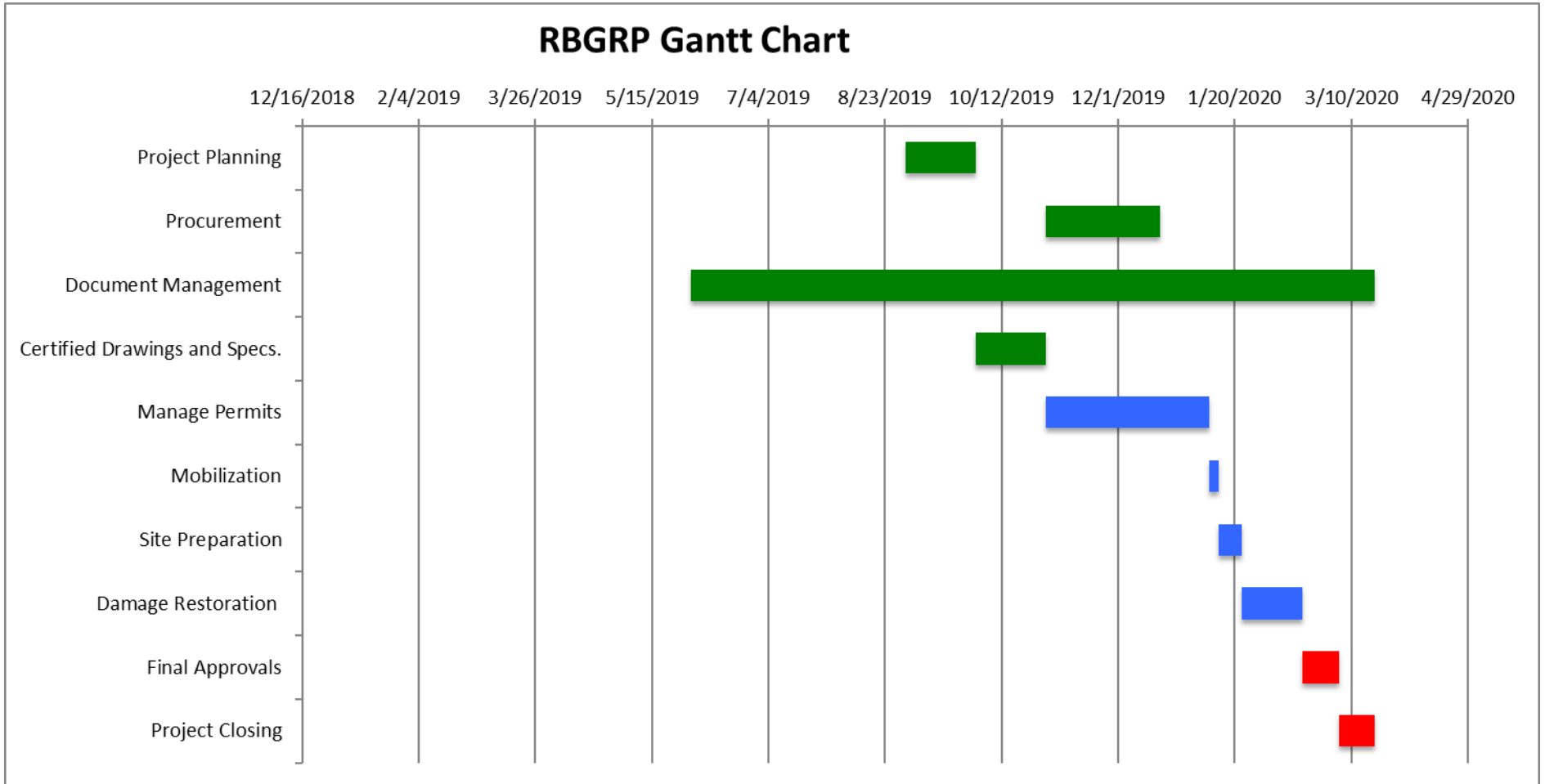


Figure 7. RBGRP Gantt Table Source: R. López, (2019)

#### **4.3.7 Schedule Control**

Controlling schedule involves monitoring the activities' project status, updating project progress, and managing changes to the schedule baseline. This project is time sensitive, since its construction phase execution is not possible during the hurricane season, which covers the period from January 1 to May 31. The schedule version approved to be used as a baseline (refer to figure 10) can only be changed in case of an emergency.

The project manager is responsible for holding bi-weekly schedule updates/reviews, determining impacts of schedule variances, submitting schedule change requests, and reporting schedule status in accordance with the project's communications plan. The project team is responsible for participating in bi-weekly schedule updates/reviews, communicating any changes to actual start/finish dates to the project manager, and participating in schedule variance resolution activities as needed. The project sponsor will maintain awareness of the project schedule status and review/approve any schedule change requests submitted by the project manager.

#### **4.3.8 Schedule Changes and Thresholds**

If any member of the project team determines that a change to the schedule is necessary, the project manager will review and evaluate the change through the change control process. The project manager must determine if the change is acceptable. Once the change request has been reviewed and approved, the project manager will ensure that the schedule is adjusted, and changes are communicated and recorded. The project's sponsor must review and approve this request before the schedule can be re-baselined.

#### **4.3.9 Report Schedule**

The project manager will review and update the project schedule with the scheduler in a weekly basis. The actual information will be compared to the schedule baseline to perform the completion percentages and variance calculations. The key to effective control of the project performance (schedule) will be based on comparing actual progress with planned progress on a timely and regular basis and taking necessary corrective action immediately, when required.

The project schedule control process involves regular data gathering on project performance, compared with the planned performance. We will be using:

- Progress reporting – Reports are to be created detailing the actual start and finish dates of activities and the remaining duration of unfinished activities.
- Variance analysis- Variance analysis compares planning data with actual performance to discover delays or variations in the project schedule.

For this project, variations in schedule shall be monitored and controlled consistently to ensure critical path activities identified (permitting process) do not affect construction execution outside the limiting period identified from January 1 to May 31. Any variation affecting the critical path activities is to be defined and discussed to find and implement the appropriate corrective measures to avoid project delays.

#### **4.3.10 Risks**

While planning and managing the project schedule, risks may be identified. All risks regarding the project schedule are documented in the risk management plan and shall be analyzed, evaluated, and updated frequently to avoid project delays.

#### **4.3.11 Schedule Management Plan Approval.**

This schedule management plan has been reviewed and approved by:

Approver Name	Title	Signature	Date
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

### Revision History

Version	Date	Reason	Executive Sponsor Sign Off

## 4.4 Cost Management Plan

### 4.4.1 Introduction

The purpose of this cost management plan is to define the methodology by which costs associated with the restoration of the Gurabo Riverbank Project will be managed. The cost management plan is guided by PMBOK® recommendations to plan, manage, and control costs.

#### 4.4.1.1 Approach

The RBGR Project is fully financed by funds assigned by AML's insurance policy because of Hurricane Maria damages. The funds are limited to a maximum amount of \$300,000.00. Costs for this project will be managed with the activities identified in the work breakdown structure (WBS) (refer to scope management plan). The cost estimate amount will come from input provided by experienced professionals, such as the project design engineer as well as the review of historic information and vendor bids' existing cost guidelines.

Earned value calculations will be used to measure and manage the financial performance of the project. Any cost variance reflected will be immediately reported



and will require a corrective action from the project manager in order to bring the cost expenditures to the expected levels.

#### 4.4.2 Roles and Responsibilities

To complete this project successfully, all key project members and stakeholders must adhere to and work within this cost management plan and the overall project plan it supports. The roles and responsibilities towards the cost management plan are included in the table below.

**Table 16 Roles and Responsibilities Related to the Cost Management Plan**

Names / Roles	Responsibilities
Project Manager-Francisco Quiles	The project manager will be responsible for the day to day management of project funds and he is authorized to execute the expenditure of project funds as necessary in accordance with the cost management plan and allocated project budget. He may not authorize the use of any additional funding without prior approval from the project sponsor. The project manager will also establish metrics and variance analysis tools in order to provide status updates to the project sponsor and other stakeholders.
Project Sponsor	The project sponsor is responsible for the approval of the project's cost management plan. Additionally, he will be responsible for approving the project's budget, corrective actions, and any additional funding that may be needed, in case of an emergency or critical situation.
Project Team Members	The project team is responsible for executing assigned work in accordance with the cost management plan. They are also required to assist the project manager in the

Names / Roles	Responsibilities
	implementation of metrics and variance analysis tools to ensure all project deliverables are performed within the allocated budget constraints.
Contractor -LP Construction	The contractor is responsible for providing an initial project cost estimate which includes all activities associated with the project. Additionally, the contractor shall provide a WBS which includes all construction work packages and their associated costs. The contractor is responsible for executing work packages in accordance with all approved budget and funding requirements.
Designer (Subject Matter Expert)	The designer will provide his expertise to define accurate cost estimates for all project activities.

Source: López, R. (January 2020)

#### 4.4.3 Measuring Project Costs

Expert judgment will play a key role in establishing costs for activities. Cost estimates for all project activities are to be defined with the use of the expert judgment of the project designer and the team members with expertise in this kind of project. In addition, historical information and cost guides are to complement the effort to ensure accurate amounts result from the process. By aggregating the estimated costs of individual activities or work packages, an authorized cost baseline will be established.

The total funds authorized to execute the project are \$300,000. The cost baseline, which is the approved version of the project budget excluding any management reserve, will be measured against the project actual performance to keep it controlled and monitored adequately and in a timely manner. In summary:

- **Cost estimate** = sum of costs for work packages/activities
- **Cost baseline** = cost estimate + contingency reserve
- **Budget** = cost baseline + management reserve
- **Management reserve:** It takes into account the cost of uncertainty= probability of risk occurring x impact if it occurs. The probability of occurrence of each risk was obtained through data gathering from expert judgment experience and historical information (refer to table 20).

**Table 17 RGBRP Budget**

Code	Activity	Cost Estimate	Contingency Reserve (10%)
1.1.1	Project Management	\$ 41,500.00	\$ 4,150.00
1.1.2	Design and Permits	\$ 26,500.00	\$2,650.00
1.1.3	Construction	\$125,000.00	\$12,500.00
1.1.4	Closeout	\$22,000.00	\$2,200.00
	<b>Total Cost Estimate</b>	<u>215,000.00</u>	<u>\$21,500.00</u>
	<b>Cost Baseline</b>	\$236,500.00	
	<b>Management Reserve</b>	\$49,450.00	
	<b>Budget</b>	\$ 285,950.00	

Source: López, R. (2020)

**Table 18 Management Reserve Calculation**

Risk	Probability	Impact if It Occurs (\$)
Natural events (hurricanes and earthquakes)	10%	\$ 21,500.00
Materials /Equipment delays	8%	\$17,200.00
Rework	5%	\$10,750.00
<b>TOTAL MANAGEMENT RESERVE</b>		<b>\$49,450.00</b>

Source: López, R. (2020)

The contingency reserves were calculated per major work package with each work package and assuming a 10% for the calculation, based on the standard AML process.

#### **4.4.4 Reporting Format**

Reporting for cost management will be included in the bi-weekly project's status report. The updated cost reporting will contain the CV and CPI metrics. All cost variances outside of the thresholds identified in section 4.4.5 will be reported, and an action plan will be required immediately.

#### **4.4.5 Cost Variance Process**

Any cost variance reflected will be immediately reported and will require the creation of a corrective action plan to bring the cost and/or schedule performance indexes below the alert level. The project manager will provide options to correct the variances within three (3) business days from the day that the cost variance was first reported. The cost variance corrective action plan will detail the actions necessary to bring the project back within budget and the means by which the effectiveness of the actions in the plan will be measured. Upon acceptance of the cost variance corrective action plan, it will become a part of the project plan, and the project will be updated.

#### **4.4.6 Cost Change Control Process**

The RBGR Project cost control will use the earned value approach to calculate cost variances that will determine whether the project is over budget or under budget. For this project, which has a fixed budget and an accelerated construction phase schedule, any variation reported in CPI or CV will be identified as critical, and a corrective plan will be required to bring the projects' performance back to the proposed cost. The project manager will calculate actual costs for all cost categories and WBS elements and compare these actual costs to the projected baseline costs on a weekly basis. These

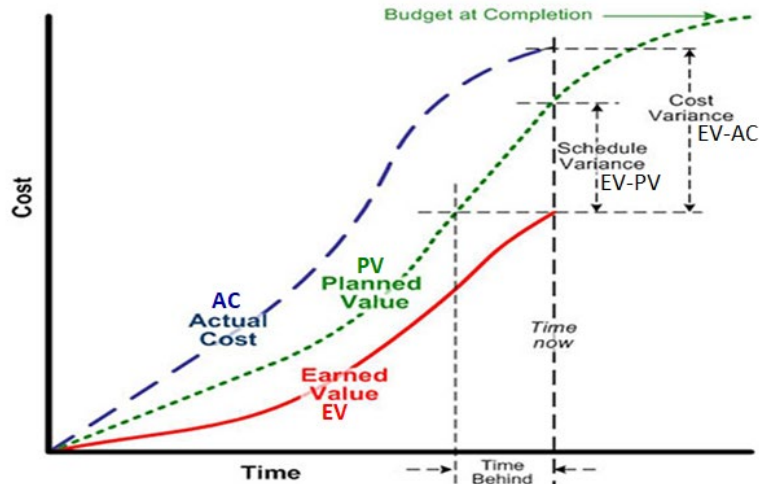
comparisons will be used to generate the data for all metrics and status reports as well as variance analysis. Variances will be calculated by deducting the actual costs from the earned value. The appropriate action(s) will be taken based on the extent of the variance:

- Positive cost variance ( $>0$ ) : (the project work is costing less than planned in the budget) - If this occurs, there will be an examination of activities and associated costs to ensure quality has not been affected.
- Negative cost variance ( $<0$ ) : (the project work is costing more than planned in the budget) – In the event that this occurs, there will be an examination of activities and associated costs to determine/identify any event or circumstance that arose and in effect increased costs. In which case, risk management strategies would have to be employed. As an added measure, CV can be calculated for each work package for better monitoring and control.
- Neutral cost variance ( $=0$ ) : (expenses as planned in the budget) – If there is zero variance, then the project manager will continue to monitor project budget expenditure and activities to keep the project on schedule as planned.

Performance reviews done once a week will include:

- Updating the schedule and actual costs associated with the current progress
- Inspections of work done and matching with the budget
- Communicating project progress and budget updates to stakeholders

The figure below visually provides a guidance for the earned value process to be used to control costs in this project.



**Figure 8. Earned Value Management- Cost Variance Visual Guidance. Retrieved from <http://denkoit.com>. Copyright 2019.**

The cost change control process will follow the established project change request process (refer to scope management plan). The project budget/cost changes must be approved by the project sponsor.

#### 4.4.7 Cost Management Plan Approval

The signatures of the people below indicate an understanding in the purpose and content of this document by those signing it. By signing this document, you agree to this as the formal cost management plan for the RBGRP.

Approver Name	Title	Signature	Date
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

## Revision History

Version		Date		Reason	Executive Sponsor Sign Off

## 4.5 Quality Management Plan

### 4.5.1 Introduction

The quality management plan for the RBGR Project established the activities, processes, and procedures for ensuring a quality product (result) as a conclusion of the project. As this project is sensitive in regard to nature, the ecosystem, and the surrounding community, AML has a major responsibility for making sure that all codes, standard requirements, and regulations are followed.

#### 4.5.1.1 Approach

The RBGR Project will ensure quality is planned for the materials used, execution of processes necessary for the construction activities, and additional to obtain the desired result. The final product's quality will be defined by the input provided by the quality manager, project manager, sponsor, and expert subject matters that may be involved in the project team. Construction execution process quality will focus on the processes by which the project deliverable will be designed and constructed. Establishing process quality standards will ensure that all activities conform to organizational and regulatory standards, which results in the successful delivery of the product.

The project manager and the quality manager will define and document all organizational and project specific quality standards for both product and processes. All quality documentation will become part of the project management plan. The quality manager will be responsible for working with the project team to define metrics, conduct

measurements, and analyze results. Within the project lifecycle, quality improvements may be identified by any member of the project team. If an improvement is implemented, the project manager will update all project documentation to include that improvement, and the organizational documentation will be updated.

#### **4.5.2 Quality Requirements**

The final product quality standards and requirements will be determined by the project manager with the support of the quality manager and project team. The standards are to be based in the construction building code requirements, environmental regulations, safety regulations, and internal AML standards. One of the critical requirements to be included will be the specific details of the materials required to be installed for the functionality of the design (rock specifications), which are to be provided by the project designer. The designer feedback will be used by the quality team and the project manager to define the metrics to measure quality. As the construction is executed, the process metrics will be measured and analyzed to determine the quality of the process. The project shall meet all quality requirements to be certified and approved.

#### **4.5.3 Quality Assurance**

The quality assurance is focused on planning, documenting, and agreeing on a set of guidelines that are necessary to assure quality. To ensure project quality is achieved, an iterative quality process will be used throughout the project life cycle. This process includes measuring metrics, analyzing process data, and continuously improving the processes, as necessary. To perform quality assurance, the following steps or actions will be performed by the project team.

1. Analyze similar projects performed as well as review lessons learned to take advantage of the methodology used through benchmarking and best practice implementation



2. Ensure that the main stakeholders have fully understood the construction regulatory standards and conditions
3. Ensure that best management practices are always implemented in all the projects' processes

Since the RBGR Project is an ecological, environmental, and community sensitive project, the permitting agencies' inspectors can visit the project site at any time to review documentation and/or audit project execution. Systematic verification and monitoring of project results periodically through internal or external quality audits and inspections are to be performed to detect and correct signs of deviations or errors in the project. The recommended key performance metrics and established tolerances are identified below:

**Table 19 RBGR Project Key Performance Metrics and Thresholds**

<b>Process Action</b>	<b>Acceptable Process Standards</b>	<b>Process Phase</b>	<b>Assessment Interval</b>
Stabilization rocks	Size: between 1.5 meters -1.6 meters	Construction execution	Whenever rocks are received at the project site
Personnel training assurance	100% completion	Construction execution	Every time new personnel is hired and/or bi-weekly
Environmental reporting assurance on time	100% compliance - Monthly reports are to be submitted to the regulatory agency no later than the 5th day of the next month.	Construction execution and closeout	Monthly frequency
Construction inspector report	Zero (0) non-compliance	Construction execution and closeout	Bi-weekly frequency

Source: López, R. (2020)

The project manager will schedule weekly project meetings to include a review of project processes, any discrepancies and/or audit findings from the quality manager,

and a discussion on process improvement initiatives. All quality assurance efforts results (inspections and audits ) must be documented, implemented, and communicated to all stakeholders. The Table 22 is the quality assurance log to be completed and updated accordingly.

**Table 20 Quality Assurance Log**

<i>Inspection /Audit #</i>	<i>Date</i>	<i>Required Value</i>	<i>Acceptable (Y/N)</i>	<i>Recommendation</i>	<i>Date Resolved</i>

Source: López, R. (2020)

#### **4.5.4 Quality Control**

Quality control (QC) activities are performed to monitor and record the results of quality assurance, measure quality performance levels, and recommend necessary changes (corrective actions) to the overall quality management plan. To control project quality:

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

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

- Weekly project meetings. The assigned project members will gather, analyze, and compare data with the controls identified. They need to compare quality control measurements against established control limits and tolerances. All results are to be communicated formally in a report and through meetings.
- Use control tools, such as the use of control tables. The control tables help monitoring, controlling, and improving processes over the project lifecycle.
- Check sheets: These will be primarily used as a data collection tool.
- Audits: Frequent audits will be carried out to ensure that the project is progressing as planned. (Recommended audit frequency will be at 20%, 40%, 60%, and 90% of project completion). Audits will include:
  - Analyzing quality control data to determine if quality problems exist
  - Identifying process improvements that will increase quality
  - Performing root cause analysis to determine necessary improvements
  - Determining preventative actions to deter future quality issues

The RBGR Project results must follow established standards and tolerances and will be certified by the designated inspector.

#### 4.5.5 Quality Management Plan Approval

The signatures of the people below indicate an understanding in the purpose and content of this document by those signing it. By signing this document, you agree to this as the formal quality management plan for the RBGRP.

Approver Name	Title	Signature	Date
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

## Revision History

Version		Date	Reason	Executive Sponsor Sign Off

## 4.6 Resource Management Plan

### 4.6.1 Introduction

AML, a multinational biotechnology company, is committed with compliance, safety, environmental sustainability, and excellence towards resource management. As part of the project management processes, this resource management plan will document the methods to identify, acquire, develop, and manage the human resources and control the materials necessary to successfully complete the RBGRP.

### 4.6.2 Roles and Responsibilities.

All project team members (internal and external) must clearly understand their roles and responsibilities to successfully perform. The project staff required competency, their corresponding roles and responsibilities as well as the materials required were identified with the input obtained from expert judgment, lessons learned from other projects, designer recommendations, project estimator feedback and from AML standard procedures.

**Table 21 Resource Management Plan- Roles and Responsibilities Summary**

Role	Responsibility
Project Sponsor	- Will keep communication and involvement with the project

Role	Responsibility
Project Manager	<ul style="list-style-type: none"> <li>- Is responsible for evaluating the performance of the project team</li> <li>- Will ensure communication mechanisms with all stakeholders are correctly executed</li> </ul>
Design Engineer	<ul style="list-style-type: none"> <li>- Is responsible for defining and including in a formal design all construction codes, requirements and materials' specs needed for project success</li> <li>- Supports the project manager and the project team to define people and material resources required for the project</li> <li>- To keep communication with the project manager and with any required team member, as required</li> <li>- To advise of any discrepancy or conflict to avoid misunderstandings or delays</li> <li>- To behave and perform in an appropriate and ethical way</li> </ul>
Project Team	<ul style="list-style-type: none"> <li>- To participate in the project meetings and provide updates of the project on a daily basis</li> <li>- To ensure their trainings are valid</li> <li>- To behave and perform in an appropriate and ethical way</li> </ul>
Contractor	<ul style="list-style-type: none"> <li>- To participate in the project meetings and provide updates of the project on a daily basis</li> <li>- To behave and perform in an appropriate and ethical way</li> </ul>
Inspector	<ul style="list-style-type: none"> <li>- Is responsible for ensuring compliance and communicating any deviation or problem to the project manager</li> <li>- To behave and perform in an appropriate and ethical way</li> </ul>
Human Resource	<ul style="list-style-type: none"> <li>- Will coordinate training times/locations, if required</li> </ul>

Role	Responsibility
Manager	<ul style="list-style-type: none"> <li>- Will provide training status to the project manager</li> <li>- Assists the project manager in identifying training resources and associated costs</li> </ul>
Quality Manager	<ul style="list-style-type: none"> <li>- Assists the project manager in ensuring project quality and communicating it adequately to the team and stakeholders</li> </ul>

Source: López. R. (2020)

### 4.6.3 Staffing Skills and Competencies

Since AML projects are highly related to manufacturing operations and not to hydro-geological modifications, there is to be an assurance that the human resources required are identified along with their appropriate skills and experience to fulfill the project requirements. The competency and capability of project team members required to complete assigned tasks and activities within the established time and quality parameters (proficiency) were categorized based on:

- 1 – Proficient
- 2 – Competent
- 3 – Learner
- 4 – Novice

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

**Table 22 RBGRP Expected Competency by Role**

Skills	Project Manager	Design Engineer	EHS Inspector	Field Engineer	Inspector	Scheduler	Cost Controller	Contractor	Resource Manager	Quality Manager
Leadership/Management	1	1	1	1	1	1	1	2	2	1
Budgeting	1	2	2	2	2	2	2	2	2	1
Scheduling	1	2	2	2	2	1	2	2	3	3
Executive communication	1	2	2	2	2	2	2	1	1	1
Quality experience	1	2	2	2	2	2	2	2	1	1
Compliance experience	1	1	1	1	1	2	2	2	2	1
Safety experience	1	2	1	1	1	3	3	1	3	2
Design experience	2	1	3	2	2	2	2	2	4	4
Construction codes	2	1	2	2	1	2	2	1	4	4

Source: López, R. (2020)

#### 4.6.4 Assumptions and Constraints.

**Table 23 Project Assumptions and Constraints**

Resource Type	Topic	Assumption/Constraint
Human Resources	Staff Participation	Project internal staff assigned to the project will be able to participate, as they are required.
	Training Funding	Training funds available will be enough to prepare project participants, as required.
	External Staff	External contractors will be available to participate during the time proposed, and no additional time or replacement will be required.
	Regular Work Week	A regular workweek will be from Monday through Friday, 40 hours in duration.

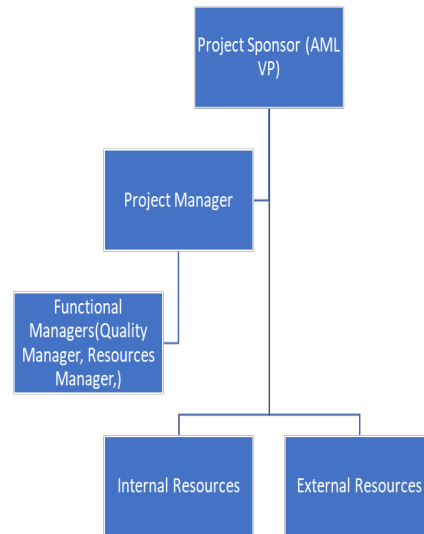
Resource Type	Topic	Assumption/Constraint
Other resources (materials)	Materials Availability	It is assumed that materials required for the daily project administrative processes are always available and supplied by the AML engineering program. It is assumed that construction materials will be available at the time of the project execution.
	Materials specifications	The only materials required for the construction execution are the rocks (to be defined in the design) and the erosion control measures to be installed in the project. All the material required for the construction execution is to be provided by the selected contractor, in compliance with the specifications to be provided by the designer.

Source: López, R. (2020)

#### 4.6.5 Project Organization

The AML project organizational table will assist the project team in identifying and documenting key project team members, management, and other stakeholders. As part of identifying and documenting the overall project governance and roles and responsibilities associated with a project, the organizational table included as figure 10, will help to visually display the project domain.





**Figure 9. General Project Organizational Table Source: López, R. (January 2020)**

A RACI table was prepared to show the relationship between project tasks and team members. Any proposed change to project responsibilities must be reviewed and approved by the project manager, and applicable documents must be updated accordingly.

**Table 24 RBGR RACI Table**

Activities	Project Manager	Design Engineer	EHS Inspector	Field Engineer	Permitting Expert	Inspector	Scheduler	Cost Controller	Contractor	ResourceManager	Quality Manager
Requirement gathering	R	R	I	I	C	I	I	I	C	R	R
Change requests	R	C	I	C	C	C	C	C	C	C	C
Site management	R	I	I	I	I	I	I	I	I	I	I
Permits/ Approvals	A	C	C	I	R	C	C	I	I	I	I
Project scope	R	C	C	C	C	C	C	C	I	I	I
Project communications	R	C	C	I	C	C	C	C	I	I	I
Project quality	A	C	C	C	C	C	I	I	I	I	R
Stakeholder management	A	I	I	I	I	C	I	I	I	R	I
Accounting	A	C	I	I	I	I	C	R	I	I	I
Status reports	A	C	C	I	C	C	C	C	C	C	C
Manage site workers	A	I	I	I	I	C	I	I	I	I	I
Procurements	A	I	I	I	I	I	C	C	I	R	I

Key:

R – Responsible for completing the work

A – Accountable for ensuring task completion/sign off

C – Consulted before any decisions are made

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

Source: López, R. (2020)

#### 4.6.6 Resource Estimate

Due to the proposed project's conditions in regard to funding, scheduling, and scope requirements, the human resources estimation is to be performed based on expert judgment and on the review of lessons learned documentation. All materials directly related to administrative project processes such as office supplies, communication equipment, etc., are part of the AML engineering program supplies inventory always in stock and available to AML projects' staff. The materials required for the RGBRP construction execution are to be defined and estimated by project designer and included in the project certified drawings and specifications to be used by the contractor. The project contractor will be responsible to supply all required project material in compliance with requirements detailed in the Quality Management Plan and drawings and specs to be prepared by the designer.

**Table 25 RBGRP Estimated Human Resources**

<b>Role</b>	<b>Amount of Resources Needed</b>	<b>Type of Resource</b>
<b>Project Manager</b>	1	Internal
<b>Design</b>	1	External(outsource)
<b>Inspector</b>	1	Internal
<b>Human Resources Leader</b>	1	Internal
<b>Quality assurance professional</b>	1	Internal
<b>Scheduler</b>	1	Internal
<b>EHS Inspector</b>	1	External(outsource)
<b>Cost Controls</b>	1	Internal
<b>Permitting expert</b>	1	External(outsource)
<b>Field Engineer</b>	1	Internal
<b>General Contractor Team</b>	6	External(outsource)

Source: López, R. (2020)

Details of the resource allocation and human resources hours per tasks are included in the resource calendar (refer to table 28).

#### **4.6.7 Staffing Management**

##### **4.6.7.1 Staff Acquisition**

The RBGRP will require internal and external personnel to perform the required project activities. The project manager should work with the human resources team to advertise positions and perform interviews. Staff may also be replaced by redirecting resources from within or outside the project, or their workload may be absorbed by other staff.

##### **4.6.7.2 Virtual Team Management Process**

Virtual meetings may be necessary, specially at the planning phase to ensure adequate communication with design specialist and the permitting specialist. Meetings can be held through skype, facetime, or conference calls. All stakeholders are responsible for having the corresponding tools to connect to virtual meetings, as planned.

##### **4.6.7.3 Resource Calendar**

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

**Table 26 General Resource Calendar Table**

<b>WBS #</b>	<b>Task</b>	<b>Total Duration (days)</b>	<b>Human Resources</b>	<b>Start</b>	<b>Finish</b>
1.1.1	Project Planning	30	Project manager, design engineer, scheduler, cost control, quality manager, resource manager, permitting expert, and legal counselor	9/1/2019	10/1/2019

<b>WBS #</b>	<b>Task</b>	<b>Total Duration (days)</b>	<b>Human Resources</b>	<b>Start</b>	<b>Finish</b>
1.1.2	Procurement	21	Legal counselor, procurement manager, resource manager, and project manager	10/31/2019	12/19/2019
1.1.3	Document Management	45	Project manager and 1 additional resource (project team)	6/1/2019	3/20/2020
1.2.1	Certified Drawings and Specifications	20	Design engineer and project manager	10/1/2019	10/31/2019
1.2.2	Manage Permits	70	Permitting expert and inspector	10/31/2019	1/9/2020
1.3.1	Mobilization	4	3-contractors, 1 inspector, project inspector, project coordinator, and safety inspector	1/9/2020	1/13/2020
1.3.2	Site Preparation	10	Contractors (8), safety inspector, scheduler, and construction inspector	1/13/2020	1/23/2020
1.3.3	Damage Restoration	26	Contractors (15-20), safety inspector, project coordinator, project scheduler, and construction inspector	1/23/2020	2/18/2020
1.4.1	Final Approvals	16	Contractors (8-10), safety inspector, construction inspector, permitting expert, and project manager	2/18/2020	3/5/2020
1.4.2	Project Closing	15	Project coordinator, project scheduler, procurement professional, project inspector, and project manager	3/5/2020	3/20/2020

Source: R. López (January 2020)

#### **4.6.7.4 Team Development Plan**

The project manager shall document the process for improving competencies, team member interaction, and the overall team environment.

#### **4.6.7.5 Skills and Competency Development**

The project manager will anticipate that all his project team members are competent (refer to table 23 for reference of staff competency requirements). All internal and external resources are to be fully competent with their specific roles. Due to the criticality of this project, no additional competency development is to be provided.

#### **4.6.8 Performance Reviews**

The project manager will review the overall performance of the project during the project lifecycle. The field engineer turns will report, at least once a week, the status of the activities performed along with the contractor's performance. Day-to-day management of assigned project staff is the responsibility of the project manager, including contractors (external resources). However, for internal resources, the performance evaluations, performance issues and recognition, promotions, and disciplinary actions are typically still the responsibility of the human resource manager. Controlling resources includes the appraisal of employees' performance and project performance. The performance report provides the basis for managerial decisions on how to manage the project team. Employee performance metrics can include:

Quality of activities completed

- Work behavior
- Job-related attributes

After conducting employee performance reviews, the PM should:

- Provide feedback to employees about the areas of opportunities
- Take corrective actions

- Reward excellence performance to encourage continuous excellence

#### **4.6.8.1 Recognitions and Rewards**

AML's project internal employees with excellence in execution and performance shall receive an economic compensation and/or compensatory time, based on AML standards.

#### **4.6.9 Conflict Management**

Conflicts on projects are often caused because of stress levels, lack of information, personal differences, role conflicts, and limited resources. Although good planning and communication and team building can reduce the amount of conflict, it can still emerge. The PM is responsible for managing any conflict that can result within or that can affect the project team or project success. The effectiveness of a conflict resolution approach depends on the situation, but basically it can be defined by:

- Evaluating the situation, including gathering data or information and observation
- Actively listening and communicating
- Partnering with the team will build a level of trust, and that in turn will create true leadership and it will minimize the risk of conflicts.
- Negotiating

#### **4.6.10 Resource Management Plan Approval**

The signatures of the people below indicate an understanding in the purpose and content of this document by those signing it. By signing this document, you agree to this as the formal resource management plan for the RBGRP.

<b>Approver Name</b>	<b>Title</b>	<b>Signature</b>	<b>Date</b>
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

### Revision History

Version	Date	Reason	Executive Sponsor Sign Off

## 4.7 Communication Management Plan

### 4.7.1 Introduction

The RBGRP communications management plan sets the communication framework for the project. It will serve as a guide for communications throughout the life of the project and it will be updated as the need of changes in communication arise. This communication management plan provides stakeholder analysis and how project information will be collected, reported, and distributed. Since the project is ecologically, timely, and economically sensitive, frequent meetings and formal communication methods are to be kept and followed.

#### 4.7.1.1 Approach

The communication requirements are to be documented in accordance with the recommendations included in the *PMBOK® Guide*. The designated project manager will take a proactive role in ensuring effective communication on this project. As with most project plans, updates or changes may be required as the project progresses or as changes are approved. The project manager is responsible for managing all proposed and approved changes to the communications management plan.

### 4.7.2 Assumptions and Constraints

The following assumptions and constraints were taken into consideration in this communications management plan:



All project communication activities will occur within the project's approved budget, schedule, and resource allocations.

Communication activities will occur in accordance with the frequencies detailed in the communication matrix to ensure the project adheres to schedule constraints.

Any deviation of these timelines may result in excessive costs or schedule delays and must be approved by the project's sponsor.

### 4.7.3 Communications Management

#### 4.7.3.1 Standardization Process

AML enforces standardization of processes as a tool to simplify the complexities of project management communications. The project team will use the AML standard organizational formats and templates for all formal project communications.

#### 4.7.4 Stakeholders' Identification Requirements

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

**Table 27 Project Stakeholders' Identification and Requirements**

Stakeholder Type	Responsibility	Stakeholder Information Requirements	Timeframe / Frequency
Sponsor (AML VP- R. Waller)	Is the champion of the project that authorizes	To receive written project updates	At least, in a monthly basis

Stakeholder Type	Responsibility	Stakeholder Information Requirements	Timeframe / Frequency
	the project, funding, and possible changes. He will be available to obtain constant updates from the project manager and project team.	To provide input to requirements	Prior to the completion of a significant project milestone
		Approves project deliverables	Upon completion of a significant project milestone
Project Manager	Coordinates overall project activities and is responsible for providing updates and keeping stakeholders aligned with project requirements and status. Will resolve any conflict and will keep the community informed.	To receive updates on project progress	In a daily basis
		To ensure communicating status to the project sponsor	Monthly, or more frequent is needed
		To direct communications with the project team	In a daily basis
Design Engineer	Will ensure all project requirements are included in the project design and that all documents are updated, as required.	To receive updates on project progress and to provide inputs or recommendations while updating the drawings and specs, as needed	As required by the project manager, more frequent if needed, or upon completion of a significant project milestone

<b>Stakeholder Type</b>	<b>Responsibility</b>	<b>Stakeholder Information Requirements</b>	<b>Timeframe / Frequency</b>
Permitting Expert	To ensure providing/communicating the permitting strategy and to ensure compliance with all regulations and standards	To receive updates on project progress and to provide inputs or recommendations	As required by the project manager or upon completion of a significant project milestone
Functional Managers (Human Resources, Quality, Procurement, and Legal)	To provide support to the PM regarding internal resources and technical aspects that may affect operation	To receive updates on project progress	Weekly
		To provide input to requirements	Weekly or as needed
Tech Team Members (Scheduler, Cost Controls, and Field engineer)	To keep their documents and activities up to date and documented and ensure providing status on a timely manner	To provide and receive updates on project progress	Weekly
Quality Assurance Professional	To perform Q & A audits and prepare and present reports	To provide and receive updates on project progress performance	Weekly
Community	To represent interest of users	To receive updates on project progress	Monthly basis or as required

Stakeholder Type	Responsibility	Stakeholder Information Requirements	Timeframe / Frequency
		To provide feedback	As they require (will contact project manager)
Inspectors	To communicate field observations and/or provide feedback in a promptly manner	To provide and receive updates on project progress	Bi-weekly or as needed
		To direct communications with tech team	Bi-weekly or as needed
Regulatory Agencies	To identify environmental regulation/condition requirements and provide their recommendations	To provide and receive updates on project progress, in accordance with permit conditions	As they require (will contact project manager)
		To direct communications with the technical team and PM	

Source: López, R. (2020)

#### 4.7.5 Communication Escalation Process

Efficient and timely communication is the key to successful project completion. As issues or complications arise regarding project communications, it may become necessary to escalate the issue if a resolution cannot be achieved within the project team. In order to ensure projects, stay on schedule and issues are resolved, the project will use its standard escalation model to provide a framework for escalating

communication issues. The table below defines the priority levels, decision authorities, and timeframes for resolution.

**Table 28 Communication Escalation Process Summary**

<b>Priority</b>	<b>Definition</b>	<b>Decision Authority</b>	<b>Timeframe for Resolution</b>
Priority 1	Major impact to project or business operations. If not resolved quickly, there will be a significant adverse impact to revenue and/or schedule.	Vice President or higher	Within 4 hours
Priority 2	Medium impact to project or business operations which may result in some adverse impact to revenue and/or schedule	Project Sponsor	Within one business day
Priority 3	Slight impact which may cause some minor scheduling difficulties with the project but no impact to business operations or revenue	Project Manager	Within two business days
Priority 4	Insignificant impact to project, but there may be a better solution.	Project Manager	Work continues, and any recommendations are submitted via the project change control process.

Source: López, R. (2020)

#### **4.7.5.1 Issue log**

The project will maintain an issue log (template included below) to record all issues resulting in the project lifecycle. Relevant personnel will be assigned according to their expertise and competence to ensure the continuation of the project in the event of a disruption. The project manager will be responsible to manage the issue log with the support of the project team.

**Table 29 Issue Log Template**

#	Description	Report by	Date	Responsible Officer	Priority	Actions or Progress Notes	Status	Date Resolved

Source: López, R. (2020)

#### 4.7.6 Project Team Directory

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

**Table 30 Project Team Directory Template**

Role	Name	Title	Organization/ Department	Email	Phone

Source: López, R. (2020)

## 4.7.7 Communication Matrix.

Table 31 Communication matrix

<b>Communication Type</b>	<b>Objective of Communication</b>	<b>Channel</b>	<b>Frequency</b>	<b>Audience</b>	<b>Owner</b>	<b>Deliverable</b>	<b>Format</b>
<i>Kickoff Meeting</i>	To introduce the project team and the project and to review project objectives and management approach	• Face to face	Once	• Project Sponsor • Project Team • Stakeholders	Project Manager	• Agenda • Meeting minutes	• Soft copy archived on project SharePoint site and project web site
<i>Project Team Meetings</i>	To review activities' status of the project with the team	• Face to face • Conference call	Weekly	• Project Team • Inspector • Designer	Project Manager	• Agenda • Meeting minutes • Project schedule	• Soft copy archived on project SharePoint site and project web site
<i>Technical Design Meetings</i>	To discuss and develop technical design solutions for the project	• Face to face	As needed	• Project Technical Staff	Technical Lead	• Agenda • Meeting minutes	• Soft copy archived on project SharePoint site and project web site
<i>Lessons learned sessions</i>	To record all good and bad decisions and results associated and further analysis to be used as guidance for other projects	• Face to face	As needed	• Project Sponsor • Stakeholders • Project Manager • Any team member, as required	Project Manager	• Lessons learned document update	• Soft copy archived on project SharePoint site and project web site
<i>Project Status Meetings</i>	To provide a report on the project status to the project sponsor	• Face to face • Conference call	Monthly, or more frequent is needed	• Project Sponsor • Stakeholders • Project Manager • Any team member, as required	Project Manager	• Slide updates • Project schedule	• Soft copy archived on project SharePoint site and project web site
<i>Project Status Reports</i>	To report the status of the project including activities, progress, costs, and issues	• Email • Face to face • Conference call	Daily, Weekly, and Monthly	• Project Sponsor • Project Team • Stakeholders	Project Manager	• Project status report • Project schedule	• Soft copy archived on project SharePoint site and project web site
<i>Post-Review Report</i>	To measure, analyze and record actual vs planned performance and results after each phase completion and at project closeout	• Face to Face	Every time a project phase is finish and at the end of the project.	• Project Sponsor • Stakeholders • Project Manager • Any team member, as required	Project Manager	• Report and record results	• Project Sponsor • Stakeholders • Project Manager • Any team member, as required

Source: Lopez, R. (2020)

#### 4.7.8 Communication Methods and Technologies

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

#### 4.7.9 Communication Monitoring and Reporting

The project work performance results are communicated to stakeholders through performance/status reports. The reports should provide all the information needed by stakeholders to the level of detail required by them. From the project management plan, the information required to identify the performance baselines for the reports will be obtained. Performance reports are to follow the AML standard templates and procedures to include the following information to be communicated:

**Table 32 Recommended Communication Monitoring**

Report	Measure	Frequency	Responsible
Project Performance Processes & Forecasts	Earned Value, Planned Value, Actual Cost, SPI, CPI, Schedule Variance, and Cost Variance	Weekly	The project manager with the support of the required project team members
Lessons Learned Review	Good and Bad Decisions, results associated	At least every time a at the end of the project,	The project manager with the support of the required project team members
Post Project Review (refer to appendix 5)	Baselines Opportunities	At the end of every project phase and at the project closeout	The project manager with the support of the required project team members

Source: López, R. (2020)



#### 4.7.10 Glossary of Communication Terminology

**Table 33 Glossary of RBGRP Communication Terminology**

<b>Term</b>	<b>Definition</b>
Communications Management Plan	Portion of the overall project management plan which details how project communications will be conducted, who will participate in communications, the frequency of communications, and the methods of communication
Communication	The effective sending and receiving of information. Ideally, the information received should match the information sent. It is the responsibility of the sender to ensure this takes place.
Stakeholder	Individuals or groups involved in the project or whose interests may be affected by the project's execution or outcome
Escalation	The process which details how conflicts and issues will be passed up the management chain for resolution as well as the timeframe to achieve resolution

Source: López, R. (2020)

#### 4.7.11 Sponsor Acceptance

The signatures of the people below indicate an understanding in the purpose and content of this communication management plan.

<b>Approver Name</b>	<b>Title</b>	<b>Signature</b>	<b>Date</b>
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

#### Revision History

<b>Version</b>	<b>Date</b>	<b>Reason</b>	<b>Executive Sponsor Sign Off</b>

## 4.8 Procurement Management Plan

### 4.8.1 Introduction

The procurement management process of the Riverbank Restoration Project considers plan procurement management, conduct procurement, and control procurement. The plan provides the identification of the items to be procured, the types of contracts, and the contract approval process and takes into consideration procurement risks and constraints.

#### 4.8.1.1 Procurement Management Approach

The proposed construction activities of the RBGR Project are based on the restoration of 350 meters of a riverbank that was damaged by Hurricane Maria in 2017, which was previously restored by AML in 2010. The project manager has the overall responsibility for the procurement of the project items with the support of the procurement manager. The project manager may delegate specific responsibilities to project team members to ensure that all items were procured for the successful completion of the project. The project manager will work with the project team, contracts/purchasing department, and other key players to manage the procurement activities from its initiation to its closing.

### 4.8.2 Procurement Definition

The project activities are to be performed by few contractors, since most of the construction execution will be performed by a general contractor through a fixed fee contract. The procurement items were defined by the project manager with the support of the project team, project designer, and procurement manager in table 36.

**Table 34 Procurement Items/Services**

Item	Purpose/Justification
General Contractor	The general contractor will be responsible for all construction execution, materials, labors, equipment, project stabilization, and waste disposal. The only material excluding from his

Item	Purpose/Justification
	contract will be the rocks required by design.
4.5 Tons of 1.5 Meters tall rocks	As per design, to stabilize the damaged portion of the riverbank
Construction Inspection Service Hours	To inspect and prepare weekly reports and to ensure compliance with codes and design
Environmental and Safety Inspection Service Hours	To inspect and prepare weekly reports and to ensure compliance with codes and design
Design Service Hours	To integrate project requirements into the drawings and specs ensuring construction codes and regulatory compliance. Will certify the drawings and documents to be submitted for permitting purposes and will update the design as required

Source: López, R. (2020)

All other services related to project management will be supported by regular AML employees which are hourly compensated.

#### 4.8.3 Types of Contracts

The RGRP is a project which its scope is different from normal AML project activities. This makes it critical to ensure having an expert contractor and designer as part of the project collaborative team. Also, since the project was previously performed in 2010, there is abundant data and documentation that supports the requirements needed to ensure an appropriate procurement process. Since the project restoration activities are well defined, a firm-fixed price contract will be granted to a general contractor. Based on this contract type, the general contractor will include all equipment, material, labor, cleaning, and waste disposal.

Additional services required such as permitting expert services and inspection services are to be contracted by hour of service provided, with a fixed maximum number of hours

approved for working. Any modification to the service hours included in the service contracts are to be evaluated by the project manager through the change control process and approved before any service can start.

#### **4.8.4 Procurement Cost Determination**

The project manager will issue a request for quote (RFQ) to request proposals from vendors that can provide the services and materials required by the project. The vendors will outline in their proposal in a breakdown of costs and will include how the work will be accomplished, who will perform the work, and proof of their experience. Proposals, which omit solicited information or contain incomplete information, will be discarded from consideration. Costs are almost always used as part of the procurement decision criteria, but in this case, experience in this type of project will be a priority.

#### **4.8.5 Procurement Risks and Constraints**

The RBGR is a critical project since its works are to be performed within the Gurabo River area. The general contractor, under a fixed fee contract, will be responsible for the 90% of activities required for the project execution and success. Risks and uncertainties regarding the vendors are to be analyzed and managed in order to ensure project continuity in case of vendor failure to comply with contract requirements. Every effort must be made to identify all constraints prior to any project or procurement planning, as constraints identified later in the project lifecycle can significantly impact the project's likelihood of success. Even though all project risks are included in the risk register as part of the risk management plan, specific risks and uncertainties regarding procurements are summarized in the table below to ensure keeping them accessible.

**Table 35 RBGRP Procurement Constraints and Risks**

<b>Risks</b>
Failure to comply with material specifications
Missing trainings and/or expertise
Failure to provide necessary equipment

<b>Risks</b>
Safety issues
Environmental incidents
Failure to comply with scheduled tasks

Source: López, R., (2020)

#### **4.8.6 Contract Approval Process**

All vendors' proposals are to be received in an open project bidding process. The bidding process will be managed by the project manager and the procurement manager. All ethical standards and procurement processes of AML are to be followed.

#### **4.8.7 Decision Criteria**

The project manager, cost controls expert, procurement manager, legal professional, and designated project members will meet to evaluate the proposals and compare and grant the contracts.

#### **4.8.8 Control Procurement**

All decisions and documents regarding procurement are subject to an audit process and must be stored electronically in the project sharepoint in the corresponding file. As part of the contract, vendors are required to agree with the restrictions, conditions, penalties that may apply during their execution, and the internal processes and standards that they are obliged to follow. Vendors' performance will be subject to an auditing process that will be performed either by the procurement manager, their supporting team or by an external source. An audit log will be completed, and results will be reported to the project manager as part of the weekly project metrics. Each metric is rated on a 1-3 scale, and a transactional efficiency calculation will be included.

**Table 36 Vendor Performance Audit Log**

Vendor	Product Quality	On Time Delivery	Documentation Quality	Development Costs	Cost / Unit	Transactional Efficiency
Vendor #1						
Vendor #2						

**Key:** 1 – Unsatisfactory 2 – Acceptable 3 – Exceptional

Source: López, R. (2020)

Vendors with an efficiency result of less than 85% will enter in a probatory process. The probatory process obliges the vendor to provide a written justification of his problems, a mitigation plan, and a commitment to comply with the efficiency performance within 7 days. Failure to comply with the requirements defined will automatically trigger the cancelation of their contract and payments' cancellation.

#### 4.8.9 Vendor Management

Even though the AML procurement department will support in the guidance and actions taken towards purchasing and contracting, the project manager will have accountability and responsibility on the selected vendors' performance.

#### 4.8.10 Sponsor Acceptance

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

Approver Name	Title	Signature	Date
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

#### Revision History

Version	Date	Reason	Executive Sponsor Sign Off

## **4.9 Risk Management Plan**

### **4.9.1 Introduction**

A risk is an event or condition that, if occurs, could have a positive or negative effect on a project's objectives. Risk management is the process of identifying, assessing, responding to, monitoring, and reporting risks. This risk management plan defines how risks associated with the Riverbank Restoration Project will be identified, analyzed, and managed. It outlines how risk management activities will be performed, recorded, and monitored throughout the lifecycle of the project and provides templates and practices for recording and prioritizing risks.

This risk management plan was created by the project manager in the planning phase with the support of the project team, and it will be monitored and updated throughout the project lifecycle. As such, this risk management plan provides the methodology to identify and quantify the risks to the project, determine the consequence and associated probability, and develop mitigation strategies. Opportunities as well will be managed to ensure project success and efficiency.

#### **4.9.1.1 Project Background**

AML proposes to repair a section of the Rio Gurabo bank that was damaged by floods resulting from Hurricane Maria in Puerto Rico during September 20, 2017. The Gurabo Riverbank stabilization activities were previously performed in the year 2010. The structural controls that were implemented included the installation of several rock vanes to redirect the erosive forces from the riverbank toward the center of the channel and the construction of a rock bench, which serves as an adequate structure to tie the rock vanes and provide additional protection to the bank toe.

#### **4.9.1.2 Approach**

The RBGRP risk management plan process methodology was based on the elements included in the PMBOK® Guide Sixth Edition and standards from the Project

Management Institute (PMI). The risks associated with the project are to be identified as early as possible in the project to minimize their impact and they will continue throughout project lifecycle. Due to the schedule and cost constraints, the risk management process meeting updates are to be held at least once a week. The steps for accomplishing the risk management plan objectives are outlined in the following sections.

#### 4.9.2 Project Constraints

The Riverbank Restoration Project intends to restore a portion of the riverbank that was affected by extreme erosion. The project has several limitations, as outlined in table 37, to consider in the risk management plan process:

**Table 37 Project Constraints**

<b>Constraints</b>	
Schedule	Project execution must be completed within January 1 to May 31, to avoid hurricane season which starts on June 1 every year.
Cost	Budget cannot exceed \$300,000.
Quality	All design specifications must be implemented. Any execution fault may affect the public image of the project sponsor and can trigger potential environmental or safety problems.

Source: López, R. (January 2020)

#### 4.9.3 Roles and Responsibilities

As part of the risk management process, several roles and responsibilities are assigned within project stakeholders to ensure their collaboration and integration in the risk identification and all concerning steps since the early stages of the project. The following table summarizes the roles and responsibilities towards the project risk management plan.



**Table 38 Project Roles and Responsibilities**

Roles	Responsibility
Project Manager	Will have the overall responsibility for the preparation, establishment, and active execution of the risk management plan. He/she is also responsible to ensure risk communication and the corresponding reporting performance.
Risk Manager Specialist	Will provide support to the project manager in preparing and executing the risk management plan.
Project Team (safety officer, environmental officer, scheduler, cost engineer, project engineer, and designer)	<p>Specific responsibilities may include the following activities:</p> <ul style="list-style-type: none"> <li>- Actively participates in the risk management meetings</li> <li>- Identifies risks</li> <li>- Supports the risk manager specialist in clarifying and documenting risks</li> <li>- Will provide status on regards risk mitigation actions</li> <li>- Will communicate status to risk owners</li> <li>- Will participate in the risk closure process</li> </ul>
Contractor (s)	Is/are responsible for providing the risks related to his/their construction activities and will report newly found risks immediately.
Design Firm	Is/are responsible for providing the risks related to his/their construction activities and will report newly found risks immediately.
Sponsor	Will define his/her constraints and requirements to ensure they are adequately taken into account in the risk management process.

Source: López, R. (2020)

## 4.9.4 Risk Management Process

### 4.9.4.1 Risk Identification

The roles and responsibilities of the stakeholders towards the risk management plan are defined and communicated (refer to section 4.9.3). Due to the short duration of the project, the risk identification activities will be continuously revised in the weekly team meetings. All assumptions made to identify risks are to be validated and reviewed continuously in the meetings to have the uncertainties under control. The risk identification process will include all risks and opportunities pertaining to the construction execution as well as the ones after project closure. Risks will be coded in the risk breakdown structure (details in section 4.9.3.2), and a risk register will be prepared to include all the risks (threats and opportunities) identified during the project lifecycle.

The project will identify as much risks as possible, since early stages of the project, and they will be reviewed and evaluated by the project manager and his team. The risk identification/management process will mainly depend on the outcome of stakeholders' risk workshop meetings. In those meetings, the risk breakdown structure will be used as a guiding tool (prompt list), along with brainstorming, interviews, and the review of similar risks that existed in previous projects (lessons learned).

### 4.9.5 Risk Breakdown Structure.

Risk categories are to be structured with the risk breakdown structure (RBS), which is a hierarchical representation of potential risk sources. The project's RBS provides several additional insights into the assessment of risk exposure on the project that will be used in the risk identification and in the prioritization process.

**Table 39 RBS for Riverbank Stabilization Project**

<b>RISK LEVEL 1</b>	<b>RISK LEVEL 2</b>	<b>RISK LEVEL 3</b>
External Risks	1. Environment	1.1 Natural environment/weather
		1.2 Site and facilities

RISK LEVEL 1	RISK LEVEL 2	RISK LEVEL 3
		1.3 Legal (regulatory) and compliance
		1.4 Waste management
	2. Community	2.1 Land limitations
		2.2 Community requirements/concerns
Internal Risks		
		3.1 Schedule and resource constraints
	3. Organization and Management	3.2 Financial constraints
		3.3 Management experience
Internal Risks	4. Personnel and Material	4.1 Personnel experience and qualifications
		4.2 Personnel and material availability
		4.3 Quality of material resources
		4.4 Safety/security requirements
	5. Engineering and Design	5.1 Project design requirements
		5.2 Construction permits and conditions

Source: López, R. (2020)

#### **4.9.6 Qualitative Risk Analysis.**

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

##### **4.9.6.1 Probability Scales.**

Risks (threats) and opportunities are identified and managed in this plan. Probability and impact scales for both situations were prepared based on several conditions. The probability scales for this project are based on the likelihood of the risk to happen within certain timings covering the short duration of the project, which is 8 weeks and the existing limitation that requires that schedule to be kept. The scoring (scale) of the risk

probability and impact using in the risk register was a standard method based on defining clear ratings and logical economic effects on the project.

**Table 40 Risk Project Probability Scale**

PROBABILITY	
1	An event we don't expect to happen in the next 8 weeks
2	An event that we don't expect to happen in the next 4 weeks
3	An event we expect to happen anytime

Source: López, R. (January 2020)

The project impact scales were also aligned to project circumstances in regard to the economic impact they will drive if it happens and understanding that the project budget is limited to \$300,000, which based on 8 weeks of project duration (5 days a week, 8 hours a day) is equivalent to \$37,500 per week, \$7,500 per day, or \$937.50 per hour).

**Table 41 Risk Project Impact Scale**

IMPACT	
1	Impact of less than \$37,500
2	Impact between \$37,501 and \$75,000
3	Impact higher than \$75,001

Source: López, R. (January 2020)

Risks that fall within the RED and YELLOW zones will have risk response planning, which may include both a risk mitigation and a risk contingency plan.

#### 4.9.6.2 Project Opportunities

Probability and impact scales for the project opportunities were also defined, taking into consideration cost savings, sponsor company prestige, and project quality.

**Table 42 Opportunities Project Probability Scale**

PROBABILITY	
1	Project benefits will sustain from 1-4 years
2	Project benefits will sustain from 5-9 years
3	Project benefits will sustain for more than 10 years

Source: López, R. (January 2020)

The project impact scales regarding the opportunities were aligned to project circumstances in regard to the sponsor's public image and prestige. Public image was related to the economical investment of the project.

**Table 43 Opportunities Project Impact Scale**

IMPACT	
1	Positive public image is translated in economical savings estimated as \$75,000
2	Positive public image is translated in economical savings between \$75,000 and \$300,000
3	Positive public image is translated in economical savings higher than \$300,001

(Source: López, R., January 2020)

#### 4.9.6.3 Probability and Impact

Based on the project's objectives and sponsor's expectations, and through the brainstorming of all stakeholders, the probability and index scales were defined as indicated in the table below.

**Table 44 Risk Probability and Impact Result Scale**

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

Source: López, R., (January 2020)

Risks that fall within the RED and YELLOW zones will have risk response planning, which may include both a risk mitigation and a risk contingency plan.

**Table 45 Probability of Opportunities and Impact Result Scale**

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

Source: López, R., (January 2020)

Opportunities that fall within the RED and YELLOW zones will be the ones that shall be considered to ensure taking advantage of them.

#### **4.9.7 Risk Identification (Risk and Opportunity Register)**

All risks and opportunities that may affect the project outcome or arise from the project assessment are to be documented in the project's risk register (log). The opportunity side of the register offers many benefits. It can offset risks, create a pool of money to serve as an incentive pool for the team to enhance profits, or act as a funding source to drive additional value to the project. Often, teams are so focused on risks that they fail to consider them as opportunities. Having an actively managed risk and opportunity register encourages project teams to look for and consider opportunities that can enhance the value of the project. Finally, the register provides an effective tool for sharing knowledge. Everyone on the team contributes, adds, and views information contributed by others. The register is also the basis for weekly or monthly meetings on risk management. At the end of the project, the register provides teams with a record of how risks were managed and the gains realized through the process for the client and the individual partners.

The risk and opportunities register was prepared based on the proposed activities expected for this type of project, constraints, and conditions. Prioritization was based on their likelihood of occurrence and degree of potential impact. Updates to register will be performed on a weekly basis due to the compromised project schedule and the criticality of the project. The project risk register and opportunities register are included in tables 47 and 48.

Table 48 Risk Register

RBS Code	Cause	Risk	Consequences	Probability	Impact	P x I	Trigger	Owner	Strategy	Cost
1.1	Cows from adjoining lands enter the river area regularly to feed and consume water because there is no fence or physical boundary between them.	Project perturbation and/or equipment damage	Interruption in the project activities that are based on \$937.50/hour	3	2	6	Hot weather days	Project Manager	MITIGATE: A security guard will be responsible to keep guard of the premises.	It will be part of the security guard responsibilities (8 weeks x 24 hours/day x 5 days/week x \$15/hour= <b>\$14,400</b> )
1.1	The riverbank project area is located in Zone A- flood area.	Heavy equipment can slide from the location into the river or it can be damaged by a flooding event.	Interruption in the project activities that are based on \$937.50/hour	3	3	9	Heavy rains	Safety Specialist Professional	MITIGATE: To update the hurricane readiness plan for this project and communicate it to contractors and all of the project team	It will be part of the safety specialist officer's responsibilities. (16 hours of work x \$20/hour= <b>\$320.00</b> )
1.1	Hurricane season in Puerto Rico starts from June 1 until November 1.	Heavy flood effects	Interruption in the project activities that are based on \$937.50/hour	3	3	9	Hurricane occurrence	Project Manager	TRANSFER: To acquire insurance to cover any possible damage resulting from flood events.	Builder's risk insurance that covers, among others, structural damage from weather events is an average premium of <b>\$6800</b> .
1.3	Archaeological findings in the project area	Additional time and cost for investigating any findings, project interruption, or even project cancellation	Project activity interruptions based on \$937.50/hour up to \$300,000 (project cancellation) and additional surveys and processes (\$15,000)	3	3	9	Excavation activities	Project Manager	MITIGATE: To perform coordinated surveys and investigations of the project site area in the planning phases	Certified third party assessment of the project area calculated as <b>\$10,000</b>
1.3	Hydraulic hose equipment integrity is guaranteed only if required maintenance is provided every 20 hours of usage	Environmental damage	Regulatory agency fines are estimated as \$10,000/day and interruption of activities as \$937.50 per day	3	2	6	Skipping a hose's maintenance	Project Safety Manager	MITIGATE: To implement equipment maintenance record keeping	Logs to be used are obtained from the organization's existing templates. (Only costs associated are for the copies of the logs, which are estimated at <b>\$10.00</b> )
1.3	Environmental regulatory inspections to the project area are randomly performed, as a permit condition.	Failure to prove compliance with permit conditions	Regulatory fines for environmental impact are calculated as \$10,000/day and interruption of activities as \$ \$937.50 per day	3	3	9	Regulatory inspection	Project Manager	MITIGATE: To ensure project weekly inspections are performed by a certified professional and a report is submitted accordingly	(Inspector's fees (8 inspections (minimum) x \$1,000= <b>\$8,000</b> )
2.1	Gurabo River is a water corps property of all citizens of PR.	Unauthorized access to the project area	Interruption in the project activities that are based on \$937.50/hour	3	1	3	Inadvertent entry of a person without awareness of the project	Project Manager	MITIGATE: To install appropriate project signs and ensure 24 hours safety officers at the entrance of the project area until the project is completed	Sign costs <b>\$200</b> and security guard salary (already accounted for)
2.2	Heavy equipment to be used can generate noises up to 105 dB.	Stakeholders' complaints/objections	Loss of Sponsors' reputation and project delay. Project activity interruptions based on \$937.50/hour and legal actions estimated as \$1,000/day	3	2	6	Heavy/loud working hours from 7 am to 4 pm	Project Manager	MITIGATE: To hold consultation events ahead of planning To maintain close dialogue with directly affected land owners and interested parties	Communication logistics and roles are to be included in the communications plan. No additional costs.
3.3	Inadequate resource management	The right resources need to be available consistently throughout the project to ensure quality and delivery at time.	Interruption in the project activities that are based on \$937.50/hour	3	2	6	The project experience peaks in workload	Scheduler and Project Manager	MITIGATE: Resource will be planned in advance, based on the delivery methodology and scope defined. This will be monitored and evaluated twice a month to reforecast demand as necessary.	Resource planning logistics is included within scheduler roles. He needs to include at least 40 hours of his duties to manage this planning. (40 hours x \$40= <b>\$1,600</b> )

Table 48 Risk Register

RBS Code	Cause	Risk	Consequences	Probability	Impact	P x I	Trigger	Owner	Strategy	Cost
3.3	Inadequate communication and lack of teamwork	The delivery team will be large and drawn from a variety of disciplines, backgrounds, and companies. Failure to achieve good communication and a spirit of collaboration will negatively impact the programmed delivery and quality.	Interruption in the project activities that are based on \$937.50/hour and project execution partial or complete failure (up to \$300,000)	3	3	9	Miscommunication of instructions expressed in a meeting	Project Manager	MITIGATE: There will be an overall project meeting to maintain communication access work packages. Official communication protocol will be set out in the communication plans, but alongside this team, days will be held to encourage collaborative working. Colocation of key team members will be utilized at relative points on the project.	A communications project plan is to be created and implemented. There are 40 hours assigned for this purpose based on \$40/hour equivalent to <b>\$1,600</b> .
4.1	Training is inadequate or insufficient.	Workplace accidents	Worker's compensation benefits can go as high as \$32,400	3	2	6	Inadequate use of personal protection equipment, tools, and safety procedures	Safety Specialist Professional	MITIGATE: To provide OSHA 30-hour construction certified training.	Training price per student construction workers is approximately \$425 X 8 = <b>\$3,400</b>
5.1	Inexperienced personnel during project execution	Workplace accidents	Worker's compensation benefits can go as high as \$32,400	3	2	6	Inadequate use of personal protection equipment, tools, and safety procedures	Safety Specialist Professional	MITIGATE: To provide OSHA 30-hour construction certified training, ensure project weekly inspections are performed by a certified professional and a report is submitted accordingly, and provide proper supervision.	Training price per student is approximately \$425 and inspector's fees (8 inspections (minimum) x \$1,000=\$8,000) (already accounted for) and supervision that will be part of the safety specialist officer's responsibilities based on \$20/hour (already accounted for).
5.1	Approved design specifications require that the stones to be used are to measure 1.5 meters.	Design implementation failure	Project execution partial or total failure. (\$300,000)	3	3	9	Site foreman inspects material upon arrival and decides	Site Foreman	MITIGATE: To have the site foreman select the rocks previous to transporting them to the site.	Costs are already included in the site foreman's salary, based on a rate of \$20/hour.
5.1	The construction of the temporary access to the project is not completed on time or to specification.	The actions delivered are either late or not of sufficient quality, leading to delays. Negative impact on achieving project completion on time and loss of reputation for the sponsor company	Project activity interruptions based on 937.50/hour and legal actions estimated as \$1,000/day	3	3	9	Project inspection/meeting status	Project Manager	MITIGATE: To set in place a robust reporting and monitoring process during construction phases To draft a construction contract with an appropriate share of programmed risks To appoint the project team to monitor quality and progress	Inspector's fees (8 inspections (minimum) x \$1,000= <b>\$8,000</b> )
5.2	Construction permit approvals are not granted as scheduled.	Project schedule delay, cost increase, and risk of insurance funds cancellation	Interruption in the project activities that are based on \$937.50/hour and project execution partial or complete failure (up to \$300,000)	3	3	9	Schedule meeting update	Project Manager	MITIGATE: To undertake pre-planning discussions with authority To prepare necessary assessments in advance and submit for third party review.	The permitting expert shall be included in the project since early stages to ensure all permitting process aspects are coordinated and aligned (approximate costs <b>\$10,000</b> ). Agency communications are to be included in the project communications plan, as part of the project responsibilities.



RBS Code	Cause	Risk	Consequences	Probability	Impact	P x I	Trigger	Owner	Strategy	Cost
5.2	Condition #20 of the construction permit establishes that failure to have a copy of all corresponding project permits on hand at the project site will result in sanctions, fines, and possible legal actions.	Failure to prove compliance with permit conditions	Regulatory fines for environmental impact are calculated as \$10,000/day and interruption of activities as \$937.50 per day	3	3	9	Regulatory inspection	Project Manager	MITIGATE: To locate a binder with all the project's permits at the project area	Require only the costs of the paper for the permit copies and the binder. Approximately <b>\$30.00.</b>
5.2	Since Hurricane Maria, there is a shortage of stone supply that is required per project design.	Failure to deliver the project on the estimated schedule	Project execution partial or total failure (\$300,000)	3	3	9	Site foreman inspects material and/or manages the material inventory.	Site Foreman	MITIGATE: To have the site foreman select the rocks previous to transporting them to the site	Costs are already included in the site foreman's salary, based on a rate of \$20/hour.
5.3	Poor quality of material resources	Failure to deliver the project on the estimated schedule	Project execution partial or total failure (\$300,000)	3	3	9	Site foreman inspects material upon arrival, and if risk occurs, new material is to be bought to replace the one that was not accepted.	Site Foreman	MITIGATE: To ensure material quality from suppliers	Costs are already included in the site foreman's salary, based on a rate of \$20/hour.
5.4	Safety regulatory inspections to project are randomly performed, as a permit condition.	Failure to prove compliance with permit conditions	Puerto Rico Department of Labor's Occupational Safety and Health Administration (PR OSHA) fines for violations can go up to \$359,000.00.	3	3	9	Regulatory inspection	Safety Specialist Professional	MITIGATE: To ensure project weekly inspections are performed by a certified professional and a report is submitted accordingly	Inspector's fees (8 inspections (minimum) x \$1,000= <b>\$8,000</b> )
5.4	Safety measures are not in compliance.	Workplace accidents	Worker's compensation benefits can go as high as \$32,400.	3	2	6	Inadequate use of personal protection equipment, tools, and safety procedures	Safety Specialist Professional	MITIGATE: To provide OSHA 30-hour construction certified training and ensure project weekly inspections are performed by a certified professional and a report is submitted accordingly	Training price per student is approximately \$425 X 8= <b>\$3,400</b> and inspector's fees (8 inspections (minimum) x \$1,000= <b>\$8,000</b> ) (already accounted for)
5.4	The stones to be used for the riverbank stabilization measure 1.5 meters.	Stone falling from the equipment causing possible injury to workers in the area	PR OSHA penalties calculated as \$13,260/day per violation, project interruption based on \$937.50 per hour, and possible legal action estimated as \$1,000/day	3	3	9	Supervision not available	Project Safety Manager	MITIGATE: To ensure the safety officer is aware of his responsibility to be present whenever there are works in progress Roles and responsibilities are to be discussed with him since the planning stages and documented	Costs are already included in the safety officer's salary, based on a rate of \$20/hour.
5.4	Inexperienced personnel during project execution	Loss of equipment	Equipment replacement can cost as much as \$100,000	2	3	6	Inadequate use of tools and machinery	Safety Specialist Professional	MITIGATE: To ensure project weekly inspections are performed by a certified professional and a report is submitted accordingly and to provide proper supervision	Inspector's fees (8 inspections (minimum) x \$1,000= <b>\$8,000</b> ) (already accounted for) and supervision that will be part of the safety specialist officer's responsibilities based on \$20/hour (already accounted for).

Source: López, R., January 2020

Table 46 Opportunities Register

RBS Code	Cause	Opportunity	Consequences/Advantages	Probability	Impact	P x I	Trigger	Owner	Strategy	Cost Savings
1.1	Reduction and prevention of flood hazards	The river will become a source of fresh, clean water	Access to clean water will create prestige and image enhancement for the company.	3	3	9	Flood hazard prevention and reduction	Project Manager	SHARE: To coordinate with the sponsor's communication and marketing department management to plan together a way to provide project results and benefits through the media (TV, radio, and news) in alignment with business needs	This opportunity can cost approximately \$3,000, but it will result in image enhancement translated in savings of more than the project total cost. COST: \$3,000 BENEFIT SAVINGS: >\$300,000
1.1	River clean up	The river can become an open space for recreation	The river can become a major destination for recreation for adjacent communities, such as fishing, boating, wildlife watching, sports, and other leisure activities.	2	2	4	Community awareness through communication	Project Manager	SHARE: To coordinate with the sponsor's communication and marketing department management to plan together a way to provide project results and benefits through the media (TV, radio, and news) in alignment with business needs	This opportunity can cost approximately \$3,000, but it will result in image enhancement translated in savings of more than the project total cost. COST: \$3,000 BENEFIT SAVINGS: >\$300,000
1.4	There will be an earth crust generation of 4,200 cubic meters from project activities.	The use of resulting project material onsite to engineering fill and stabilization	Reduced cost for disposing material out of site	3	3	9	Earth crust material generation (4,200 cubic meters expected)	Project Manager	ENHANCE: To define earth crust material temporary storage, final location, planning and coordinating all erosion control measures, and stabilization measures to ensure the material is compacted adequately	Out of site disposition costs are calculated as \$200 per every 40 cubic meters (\$21,000), while site filling of material will cost \$100 per every 40 cubic meters resulting in \$10,500 in project savings. COST SAVINGS: \$10,000
2.2	Stakeholders' complaints increase when there is miscommunication and unawareness of the issues.	To provide community awareness of erosion control importance .	Sponsor company prestige and image enhancement	3	2	6	Media information	Project Manager	EXPLOIT: To coordinate with the communication team specialist the logistics to provide project results and benefits through the media (TV, radio, news)	This opportunity can cost approximately \$3,000, but it will result in image enhancement translated in savings of more than the project total cost. COST: \$3,000 BENEFIT SAVINGS: >\$300,000
4.4	Implementation of OSHA standards for safety measures	The company will be up to OSHA standards	Reduction of insurance policy and medical expenditures	2	2	4	Safety inspections	Safety Specialist Professional	EXPLOIT: To coordinate with the insurance company to prove compliance with OSHA standards	This opportunity can reduce the insurance policy for the company providing up to \$300,000 in medical expenditures BENEFIT SAVINGS: UP TO \$300,000
5.1	Erosion control design to be implemented is a novel technique proven to work in thousands of projects in Europe.	The project to be exposed as a benchmarking for future projects	Sponsor company prestige and image enhancement	3	3	9	Erosion control solutions needed at the island	Project Manager	EXPLOIT: To coordinate with the communication team specialist the logistics to provide project results and benefits to other companies, entities, and public in general to ensure it is used as a base for other similar projects to mitigate erosion in the island.	This opportunity can cost approximately \$3,000, but it will result in image enhancement translated in savings of more than the project total cost. COST: \$3,000 BENEFIT SAVINGS: >\$300,000

(Source: López, R., January 2020)

#### **4.9.8 Risk Response Planning**

Each risk will be assigned to a project team member for monitoring purposes to ensure that the risk is adequately and timely managed and or addressed. For each risk that will be mitigated, the project team will identify ways to perform risk monitoring, controlling, and reporting throughout the project lifecycle. Appropriate options and action plans will be developed to reduce the threats of specific risks to project objectives and or take advantage of possible opportunities. All project change requests will be analyzed for their possible impact to the project risks. The risk register will be continuously updated with a specified proposed response plan for the occurrence of each risk event and an updated project management plan.

#### **4.9.9 Risk Monitoring and Control**

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

Project activities involved in risk monitoring and control will include:

- Validate risk mitigation strategies and alternatives
- Take corrective action when actual events occur
- Assess impact on the project of actions taken (cost, time, and resources)
- Identify new risks resulting from risk mitigation actions
- Ensure that the project plan (including risk management plan) is maintained
- Ensure change control addresses risks associated with the proposed change
- Revise risk management documents to capture results of mitigation actions

- Update the risk register
- Communicate risk management status and risk response follow-through as appropriate
- Establish communications as appropriate

#### 4.9.10 Risk Management Closeout

At the completion of the Riverbank Restoration Project, the successful transition of any open risks and capturing and harvesting lessons learned are important for project maintenance, support, and future project work. The following risk management activities are to be applied:

- Validation of the completion of identified risks. Document the remaining open risks and provide access to final report.
- Produce final risk management metrics and evaluate process effectiveness against the established benchmarks
- Capture risk factors and risk mitigation plans for inclusion in risk reference models (lessons learned)

#### 4.9.11 Sponsor Acceptance.

The undersigned acknowledge that they have reviewed and approved the risk management plan for the RBGRP. Changes to this procurement management plan will be coordinated with and approved by the undersigned or their designated representatives.

Approver Name	Title	Signature	Date
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

#### Revision History

Version	Date	Reason	Executive Sponsor Sign Off

## 4.10 Stakeholder Management Plan

### 4.10.1 Introduction

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

#### 4.10.1.1 Approach

Due to the criticality of this project on time, funds, and compliance, stakeholder communication flow will need to be open and strategic through the project lifecycle. A stakeholder registry will be updated and reviewed as necessary to ensure a proactive management strategy to avoid potential conflicts and ensure engagement and satisfaction.

### 4.10.2 Roles and Responsibilities

The descriptions of duties of each project roles in regard to the stakeholder management are summarized below:

**Table 47 Roles and Responsibilities**

Stakeholder (Role)	Responsibilities
Project Manager	<ul style="list-style-type: none"> <li>• To initiate effort to develop the stakeholder management plan</li> <li>• To guide initial stakeholder analysis</li> <li>• To complete the stakeholder management plan</li> <li>• To manage the schedule and activities related to stakeholder communications and engagement</li> </ul>
Sponsor	<ul style="list-style-type: none"> <li>• To identify stakeholders</li> <li>• To provide input into the categorization of stakeholders</li> <li>• To provide advice in preparation strategies to be included in the stakeholder management plan</li> <li>• To approve the stakeholder management plan</li> <li>• To play a lead role in representing the project to external stakeholders</li> </ul>
Project Team	<ul style="list-style-type: none"> <li>• To provide advice and review the stakeholder</li> </ul>

Stakeholder (Role)	Responsibilities
	management plan <ul style="list-style-type: none"> <li>• To assist in the identification and classification of stakeholders</li> <li>• To assist in the development of management strategies</li> <li>• To provide information to support stakeholder communication</li> </ul>
Government Agencies	<ul style="list-style-type: none"> <li>• Will communicate any condition or requirement to the project and community, if necessary</li> <li>• To always ensure environmental and community safety</li> </ul>
Design Firm	<ul style="list-style-type: none"> <li>• To provide information to support stakeholder communication</li> <li>• To ensure frequent and effective communication towards the project issues</li> </ul>
Construction Company	<ul style="list-style-type: none"> <li>• To provide information to support stakeholder communication</li> <li>• To ensure frequent and effective communication towards the project issues</li> </ul>

Source: López, R. (2020)

### 4.10.3 Stakeholder Management Processes

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

#### 4.10.3.1 Stakeholder Identification

A Stakeholder register resulted as the output of the stakeholder management processes which included several aspects, such as the levels of influence of each stakeholder in the project, people who are affected by the project work, and their interests.

#### 4.10.4 Stakeholder Analysis

The stakeholder analysis was prepared with the use of existing project documentation, such as the project charter, brainstorming techniques, and

meetings. Determining the stakeholder influence and impact started since the initial project phases, but it was extended until project completion.

**Table 48 Project Stakeholder Analysis**

<b>Stakeholder Group</b>	<b>Involvement in the Project</b>	<b>Problems, Needs, and Interest</b>	<b>Potentials</b>
Project Manager	<ul style="list-style-type: none"> <li>• Coordinates all the deliverables and negotiates contracts with vendors</li> <li>• Reports progress and risks to the sponsor</li> <li>• Is responsible for the overall project planning and execution</li> <li>• Is authorized by the sponsor to perform all the necessary logistics required for the execution of the project</li> </ul>	Interest on project success	Knowledge and experience
Sponsor	<ul style="list-style-type: none"> <li>• Approval of project charter and all deliverables</li> </ul>	Interest on project success	Financial support
Project Team	<ul style="list-style-type: none"> <li>• Prepares all the required documentation</li> <li>• Executes the required tasks to achieve project deliverables</li> </ul>	Interest on project success	Knowledge and experience
Government Agencies	<ul style="list-style-type: none"> <li>• Provide general requirements and conditions necessary for the viability of project</li> <li>• Approve permits/endorsements</li> <li>• Inspect/Evaluate the project execution</li> </ul>	Will provide support if regulation and permitting processes are followed correctly	Their approval is critical for the project execution
Design Firm	<ul style="list-style-type: none"> <li>• Will be responsible for preparing a design in accordance with construction codes and environmental regulations</li> </ul>	Interest on project success and compliance	Knowledge and experience
Construction Company	<ul style="list-style-type: none"> <li>• Will be responsible of constructing in accordance with drawings and specs and on time and budget</li> </ul>	Interest on project success	Knowledge and experience

Stakeholder Group	Involvement in the Project	Problems, Needs, and Interest	Potentials
Nearby Community	<ul style="list-style-type: none"> <li>Will be alert to any incompliance or project effect into their land or environment.</li> </ul>	Interest on project success within compliance	Shall be kept communicated to avoid misunderstandings and/or obstruction

Source: López, R. (2020)

Stakeholders can generally be categorized into four possible areas:

	High Impact	Low Impact
High Influence	<b>A.</b> Manage closely, keep informed, and solicit ongoing input and participation	<b>B.</b> Keep informed and meet their needs
Low Influence	<b>C.</b> Manage, but less closely; periodically keep informed; and solicit input	<b>D.</b> Monitor periodically

**Figure 10. Influence Impact Matrix Classification Retrieved from Smartsheet.com Copyright 2020.**

The stakeholders typically most critical to project success are in Category A, the high influence/high impact group. All results obtained from analysis, with the use of expert judgment and brainstorming techniques are to be incorporated in the stakeholder registry.



**Table 49 Project Stakeholder Registry**

ID	Stakeholders	Roles - Responsibilities	Main Expectations	Major Requirements	Influence/Impact (As Referred in Table 50)
1	R. Waller (AML VP)	Sponsor	The project is to be completed on time and schedule and 100% in compliance with standards.	No conflicts with the community are allowed. Must be kept informed in a frequent basis of project's progress.	A
2	Project Team (Administrative)	Subject Matter Expert	To support the project manager as required to obtain project success	Tasks are to be clearly communicated to ensure they are completed as expected.	A
3	Project Team (Field Engineers)	Subject Matter Expert	To ensure the project is executed as per design and within budget and schedule	Tasks are to be clearly communicated to ensure they are completed as expected.	A
4	Workers (Construction)	Construction Workers	To have the expertise and commitment to complete the works on time and schedule with the corresponding safety and regulatory assurances	Expectations and responsibilities are to be clearly communicated to ensure they are completed as expected.	D
5	Government Agencies	Government Representation	To represent the government and community and environmental interests	An evaluation of all regulations and conditions is to be performed prior to starting the project.	B
6	Inspector	Subject Matter Expert	To certify that the project is executed in accordance with codes and regulations	Tasks are to be clearly communicated to ensure they are completed as expected. Drawings and specifications are to be provided in advance.	C
7	Project Design Engineer	Subject Matter Expert	Construction design as required considering codes and regulations for project success	The project design must overcome flooding risks.	A
8	AML Employees	Site Employees	The project is executed in accordance with codes and regulations and not affecting AML employees in any way.	Communication in regard to project processes is to be open.	B
9	Material Suppliers	Suppliers	To provide the materials as expected (times and specs)	To receive detailed material specs with time to ensure availability and quality	D
10	Contractors	Contractors	Fair bidding processes	Fair bidding processes	B

Source: López, R. (2019)

#### 4.10.5 Stakeholder Management Strategies

Documenting the communication interest, message, channel, and frequency for each stakeholder will ensure that everything is communicated, understood, and attended as planned. Refer to the communications management plan for recommended communication channels and frequencies.

#### 4.10.6 Execution of Management Strategies

This stakeholder management plan shall be reviewed when:

- There are events scheduled to provide information for stakeholders
- There are tasks related to the preparation and review of materials to support the events and other communication activities
- There is a need for capturing input gathered from stakeholders
- There is a need to follow-up to assess incorporating the input into the project execution
- Others, as applicable

#### 4.10.7 Sponsor Acceptance

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

Approver Name	Title	Signature	Date
R. Waller	Project Sponsor		
F. Quiles	Project Manager		

#### Revision History

Version	Date	Reason	Executive Sponsor Sign Off

## 5. CONCLUSIONS

AML, a pioneer company in manufacturing operations and in the application of continuous improvement processes, has not being able to manage adequately the projects classified as “expense projects”. The lack of a project management methodology application to the AML expense projects has been the reason of their constant projects’ failure since the lack of project monitoring, control and accountability. This Project Management Plan was created using the analytical research method and the 6<sup>th</sup> edition of the *PMBOK® Guide*, and is intended to become a source of comprehensive information for improving their overall projects’ performance success rate and safeguarding their competitiveness advantage as AML mission promotes. Based on the current AML projects’ circumstances, the most relevant points resulting from this project management plan were summarized as follow:

1. The integration management plan will contribute to the acceleration of AML’s competitive advantage by aligning its project management strategies directly with their strategic business and by creating and managing the link between strategy and results. The project charter creation gives AML management and its stakeholders a formal way be able to share a common understanding of why the project is being done, the timeframe, deliverables, risks, assumptions, boundaries, and responsibilities; and since it is approved by the sponsor, it provides the project the importance it requires to be managed and executed successfully. Leveraging experience, best practices, and lessons learned, also included in the integration management plan will support the AML management oversight to cut costs and sidestep risks in AML projects, enabling them to implement stronger project management practices for the future.
2. Trying to introduce any type of structure or control in an organization or environment that has been absent of controls such as in AML’s case, can present a significant challenge. Poorly managed change control has a

negative influence on the customer's expectations, cost variances, schedule variances, team morale, resource management, and so on are inseparable from perceptions of a project's success. This Scope Management plan will provide AML significant guidance towards the scope change process, requirements, limitations and the accountability of the project manager and the sponsor towards any change approval.

3. Since this project is time sensitive, critical path activities and the schedule cost baseline determination are two major advantages of the schedule management plan. AML will be able to measure projects' progress against a formal base to ensure keeping track and managing its progress in a controlled way through the project lifecycle.
4. A major benefit resulting from the cost management plan was the identification of a cost baseline. AML will be able to measure and report projects' progress against a formal base to ensure keeping track and managing its progress in a controlled way through the project lifecycle.
5. The way to get the most value out of a project management methodology is through metrics tied to business goals, collecting the data and make it available to everyone. The quality management plan provides AML the guidance for keeping the project on track, extending those metrics across the project team and out to suppliers, contractors, the client and the stakeholders.
6. One of the biggest challenges for the AML "expense projects" has being their resources limitation, since they share resources with the projects related to capital generation. The resources management plan provides AML the way to better allocate and organize the resources needed when needed and to justify additional allocation of funds for additional resources to assist in the project, if necessary.

7. The payoff from investing time, money and resources into AML expense projects will be justified with the controlled and monitored results to be obtained in the regular occurring meetings included in the communications management plan. Those regular meetings will also develop the innovation within the team since they will be able to have forums to provide solutions and ideas that will lead to increased productivity, profitability, and project success.
8. The risk management plan was based on risk identification and on a detailed analysis on probability and impact used to evaluate the importance of each risk, to subsequently classify each risk according to their priority and to quantify them analytically and strategically. This risk management plan provides AML a guide to measure and prioritize their risk potentials and the opportunities through logic impact scales aligned to project circumstances regarding the economic impact and project budget limitations.
9. As a result of this procurement management plan, AML will be able to have a formal document that includes all important aspects related to procurement and contracts but principally they will have a way to monitor and control vendors performance. The procurement management plan will provide AML a tool to qualify their vendors, which will directly result in better project quality and positive results. This plan proves that project management is a collaborative effort that extends to management, project team, the contractors, vendors and clients working on a project. As the incorporation of project management AML expense projects matures, the connections between organizational project management and business value will become clearer and project's performance will be outstanding.
10. Project management is a collaborative effort that extends to management, project team, the contractors, vendors, and clients working on a project. As the incorporation of project management AML expense projects matures,

the connections between organizational project management and business value will become clearer and project's performance will be outstanding. The stakeholders' management plan provides AML the knowledge to envision actions the stakeholders can undertake to create value either by their direct action into the project or by their influence they may have towards it.

## RECOMMENDATIONS

AML, an expert company in the manufacturing operations and continuous improvement processes, has failed to incorporate a complete standard project management process in its projects, principally in those that are categorized as “expense projects”, which are the ones that cost more money and don’t provide revenues. This project management plan covers all concepts and processes that are critical, determinant, and applicable for any project. As a result of this plan, the following recommendations are provided to AML:

- a. The RGBRP, is one of several “expense” projects executed in AML without having controls and planning specific guidelines. The RGBR project management plan preparation was highly dependant on the information acquired from stakeholder interviews since the project skipped all planning processes governing standardized and organized project structures. The results obtained from this project management plan validate the need for standard documented processes for managing AML projects to minimize the risks of missing critical items for the completion of projects and to avoid project failure. This RGBR project management plan shall be used as a reference for upcoming projects.
- b. The RGBRP project is considered as an atypical “expense” project, because it is not related to any AML operations. To ensure having a common guide for regular “expense” operational projects, the creation of a project management plan focused on operational aspects is recommended.
- c. Since there were several limitations and assumptions used to prepare this project management plan, it shall be updated in accordance with the changes or new information flow.
- d. The AML management integration into the projects processes is very necessary. AML must manage to update its internal procedures to integrate

and communicate information related to stakeholders as well as their roles and responsibilities.

- e. Considering that delays project delays, project conflicts and cost increases , among other situations, reduce the commitment of stakeholders and put at risk the execution of future projects, the AML projects management shall ensure alliances between AML Department to ensure adequate support to the projects. Procedures and standards of all áreas must be reviewed to consider their roles and responsibilities towards projects and any other important details that can affect or support their integration.
- f. AML management shall encourage project staff to acquire updated project management training. Project management methodologies have proved to bring efficiency, agility and excellent results to projects. AML shall even explore the creation of a project management team to consistently repeat project management methodologies in all projects to minimize variability from project to project.
- g. There were six opportunities identified in the risk management plan that are equivalent to more than \$300,000 in cost savings. AML shall review and consider integrating those opportunities as part of the project scope of this RGBRP or in future projects.
- h. AML shall manage to document project lessons learned, to be used as inputs for future projects. The RGBRP scope included some modifications to a previous project executed in the Gurabo riverbank in 2010. Due to lack of lessons learned records, it was difficult to avoid possible risks and conflicts on past projects.
- i. AML has always promoted efficiency and environmental compliance assurance. After satisfactorily integrating the project management processes to all their projects, AML shall consider following and integrating



sustainable project management practices not their project planning, management and execution.

## References

- Ashikuzzaman. (2018). *Sources of Information*. Library of Information Science.  
Retrieved from <http://www.lisbdnet.com/sources-of-information/>
- Babbie, E. (2014). *The Basics of Social Research*. Wadsworth Cengage. 303-304.
- Bhat, A., (2019). *What is Research- Definition, Methods, Types & Examples*.  
QuestionPro. Retrieved from <https://www.questionpro.com/blog/what-is-research/>
- Joslin, R. & Muller, R. (2014). *The impact of project methodologies on project success in different contexts*. Project Management Institute Research and Education Conference. Retrieved from <https://pmi.org/learning/library/project-methodologies-impact-success-contexts-8947>
- Lehtonen, P., & Martinsuo, M. (2006). Three ways to fail in project management and the role of project management methodology. *Project Perspectives*, XXVIII, 6–11.
- Moffit, K., (2019). *Research Methodology: Approaches and Techniques*. Retrieved from: <https://study.com/academy/lesson/research-methodology-approaches-techniques-quiz.html>
- Morphy, T. (2008). *Stakeholdermap.com*. Retrieved from: <https://www.stakeholdermap.com/project-templates/project-actions-template.html>
- Morris, P., Crawford, L., Hodgson, D., Shepherd, M., & Thomas, J. (2006). *Exploring the role of formal bodies of knowledge in defining a profession — The case of project management*. *International Journal of Project Management*, 24(8), 710–721.
- Project Management Basics. (2017). The PMBOK. Retrieved from <http://getpmpcertified.blogspot.com/2017/03/project-management-basics-pmbok.html>
- Project Management Institute. (2017). *A Guide to the Project Management Body of*

Knowledge (PMBOK Guide)—Sixth Edition.

Srinivasan, B. (2017). *Project Management and Leadership Champions*. Retrieved from <https://pmlleadershipchamps.com/project-management-mind-maps/based-on-pmbok-6th-edition/>

Szwed, P. (2016). *Expert Judgment in Project Management: Narrowing the Theory-Practice Gap*. Project Management Institute. 1-2.

TechTerms, (n.d). *Template definition*. Retrieved from <https://techterms.com/definition/template>.

The Law Dictionary. (n.d). *What is Capital Project?* Retrieved from <https://thelawdictionary.org/capital-project>

University of Illinois Library. (2016). A definition of secondary source. Retrieved from <https://www.library.illinois.edu/village/primarysource/mod1/pg2.htm>

Wysocki, R. (2011). *Effective software project management* (6th ed.). Hoboken, NJ, 117-132.

## APPENDICES

### Appendix 1 FGP Charter

PROJECT CHARTER	
<b>Date</b>	<b>Project Name:</b>
8/26/2019	Project Management Plan for the Restoration of the Rio Gurabo Riverbank
<b>Knowledge Areas / Processes</b>	<b>Application Area (Sector / Activity)</b>
<p><i>Knowledge areas:</i>            Integration Management,            Scope Management,            Schedule Management,            Cost Management,            Quality Management,            Resource Management,            Communications Management,            Risk Management,            Procurement Management, and            Stakeholder Management</p> <p><i>PM processes:</i> Initiation, Planning,            Executing and Monitoring, Controlling and            Closing.</p>	Pharmaceutical industry/community/construction
<b>Start Date</b>	<b>Finish Date</b>
8/26/2019	03/15/2020
<b>Project Objectives (General and Specific)</b>	
<p><i>General objective:</i> To develop a project management plan, framed within the standards established by the Project Management Institute (PMI), to improve the chances of success of the Rio Gurabo Bank Restoration Project (RGBRP).</p> <p><i>Specific objectives:</i></p> <ol style="list-style-type: none"> <li>1. To develop the Integration Management Plan in order to unify and coordinate the processes and project management activities.</li> <li>2. To create a scope management plan to define key stakeholders' project requirements and expectations</li> </ol>	

3. To create a schedule management plan for assigning duration to work packages, to be monitored and controlled accordingly
4. To create a cost management plan for assigning cost to work packages, to be monitored and controlled accordingly
5. To develop a quality management plan for outlining the stakeholders' acceptance criteria to be addressed with the project execution
6. To create a resource management plan for assigning adequate human and physical resources to project work packages
7. To develop a communications management plan for clearly defining the project communication strategies
8. To create a risk management plan that identifies and prioritizes risks, provides the corresponding risk response approach for the project, and identifies potential opportunities
9. To develop a procurement management plan for identifying and assigning the contracts' types to the corresponding project suppliers, including their limitations, restrictions, or expectations
10. To develop a stakeholder management plan that identifies key stakeholders, their level of interest, and their impact/influence on the project to ensure their engagement

#### **Project Purpose or Justification (Merit and Expected Results)**

The Gurabo riverbank, located in Juncos, Puerto Rico, was damaged by extreme floods resulting from Hurricane Maria, which stroke Puerto Rico during September 20, 2017. Rio Gurabo Bank Restoration requires the stabilization of a riverbank segment of approximately 300 meters at the Gurabo River in Puerto Rico. The project sponsor, who is the company I work for, has been pursuing to restore the affected riverbank as a way to cooperate with the community efforts for ecological restoration to prevent/mitigate future negative effects that may result from heavy rain/storm events. The project funds were provided by the insurance reserves obtained by the project sponsor. Since the project does not involve any manufacturing operation or capital generation, it has not followed the corresponding project management methodology, making its execution impossible.

Since the lack of a formal project management plan is affecting the realization of this project, and taking into account the positive benefits that its successful implementation may have on the community and the environment, I will be creating it as my final graduation project, and its result will be shared with the project sponsor.

The principal benefit that will result from the creation of this particular project management plan is the demonstration of the importance of managing all types of projects through a formal project management methodology to ensure timely, costly, controlled, and quality driven project results. In fact, this project management plan will provide the basis to integrate the project management methodologies in all types of projects managed by the sponsor's company. Finally, but not least important, this project management plan will provide the motivation for all stakeholders to move forward to solve the erosion problems that are threatening the community's safety.

#### **Description of Product or Service to be Generated by the Project – Project Final Deliverables**

The final product resulting from this final graduation project will be a complete project management plan with all its subsidiary documents/plans which are: the project charter, scope management plan, time management plan, cost management plan, quality management plan, human resource management plan, communications management plan, risk management plan, procurement management plan, and stakeholder management plan.

### Assumptions

The following assumptions are to be considered:

- It is assumed that the knowledge obtained from the Master's in Project Management courses is enough to perform and complete a successful final graduation project.
- It is assumed that a proper support system will be made available to the student, as required.
- It is assumed that no uncontrolled events can disrupt the student's performance within scope and time.
- It is assumed that all required information will be available as needed.

### Constraints

The following constraints should be taken into account:

- a. Time: The final graduation project (FGP) expected completion time is only 3 months.
- b. Ambiguity: The student may not always comprehend the tutor's instructions in the initial stages.
- c. Technological/Communication constraints: Documentation/template unavailability/unaccessibility, internet/computer failure, and/or university website problems

### Preliminary Risks

- Problems with internet communication/access may cause delays in project deliverables late submission.
- Confusion or misunderstanding of an assignment or weekly requirement can result in missed deadlines or incomplete or incorrect deliverables.

### Budget

The cost estimate of this project is based on the working hours that are to be used by the graduate student to prepare it. The estimated hours are 12 hours per week, of a total of 12 weeks of work, equivalent to approximately \$7,200.

### Milestones and Dates

Milestone	Start Date	End Date
FGP Seminar	8/26/2019	9/29/2019
Tutoring	9/30/2019	1/06/2020
Reading by Reviewers	1/07/2020	1/27/2020
Adjustments	1/28/2020	2/21/2020
Board of Examiners Approval	2/22/2020	3/15/2020

**Relevant Historical Information:**

The purpose of a project management plan is to determine the project outcome, who will be involved in the project, and how the project will be measured and communicated. The RGBRP is sponsored by one of the principal biotechnological industries of the world, which is located in Puerto Rico. This industry follows high standards, procedures, and best practices for all its operations and projects, except for those projects that cannot be capitalized.

The RGBRP is one of the projects that has not been included in the normal project management methodology procedure that is followed with the biotechnology industry capital projects, since it is not considered to bring a direct economic benefit to the company. Unfortunately, two years have passed since the hurricane, and because of the lack of organization and confusion on the project requirements and stakeholders' roles, the project hasn't been able to start. It is time to make things differently, and the project sponsor is becoming aware of that. Now is the moment for transformation and for getting all projects performed adequately, and this FGP will open the door for this change.

**Stakeholders:**

- Direct stakeholders:
  - Project Manager-Rosa López
  - Tutors
  - Reviewers
  - Graduate seminar course lecturer (Carlos Brenes)
  - Board of examiner members
  - Gurabo Riverbank Project sponsor and project team
- Indirect stakeholders:
  - Family and friends

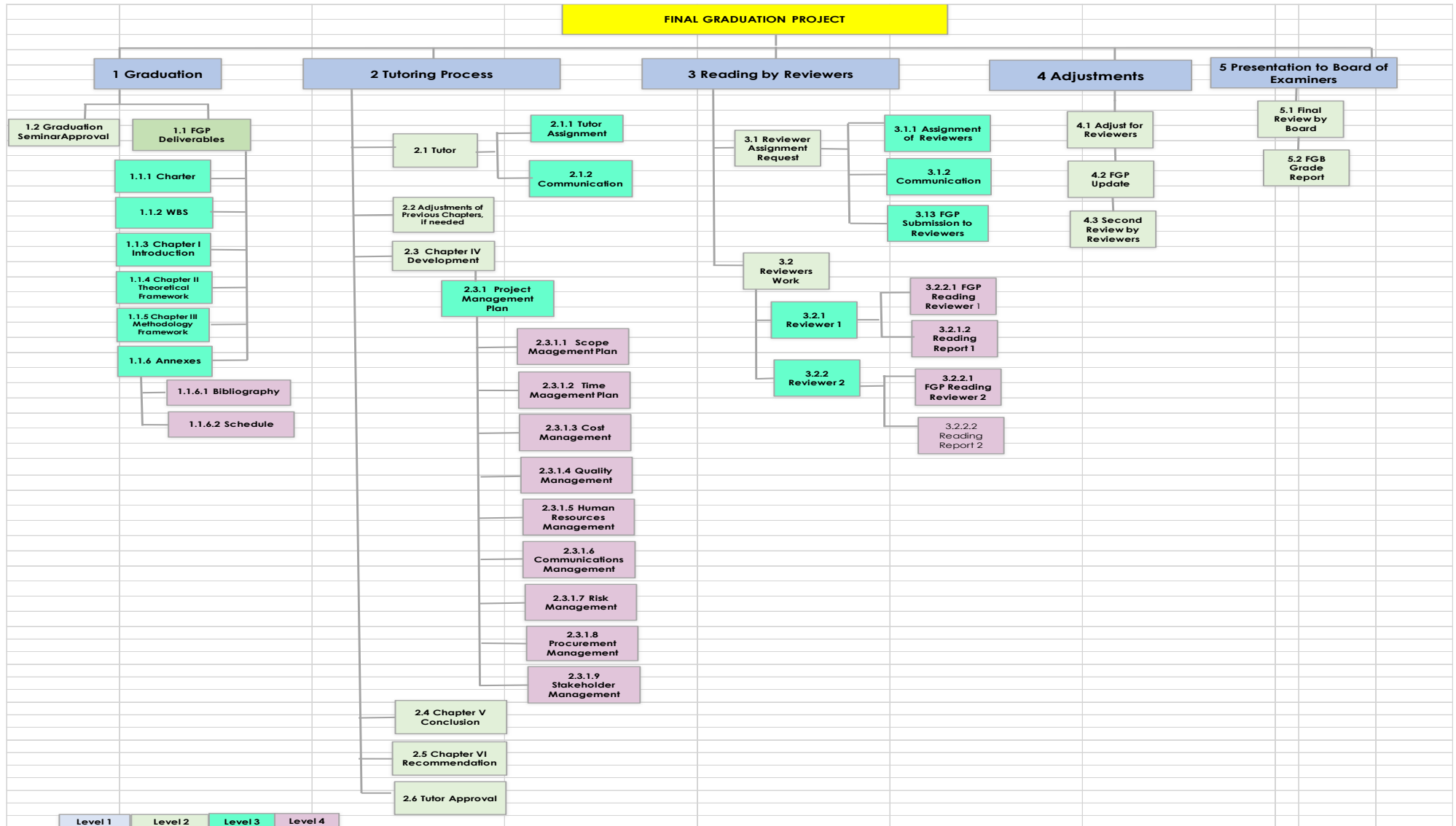
**Approval:**

Project Manager: Rosa M. López

Signature:

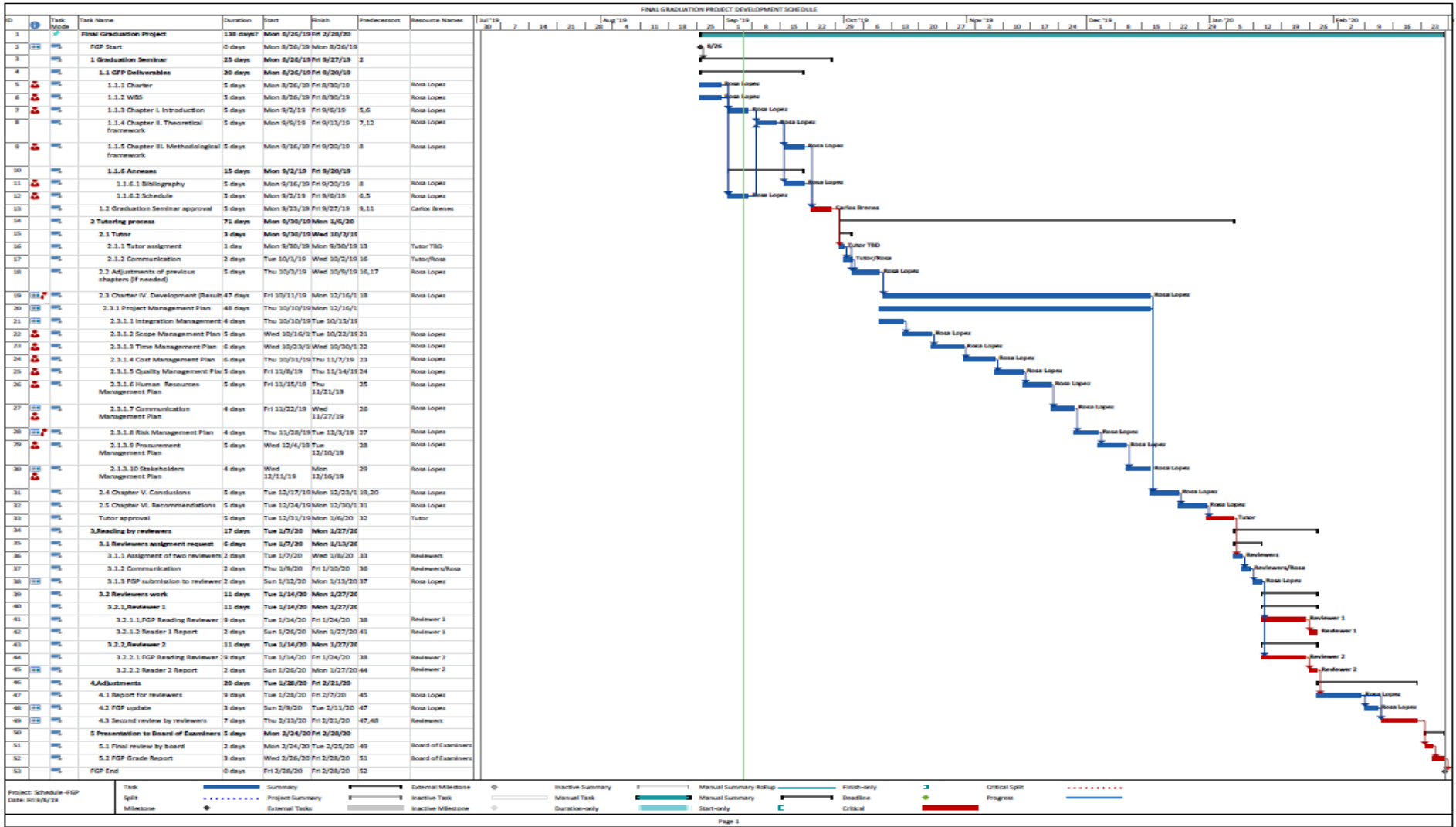
Authorized by: Carlos Brenes

Signature:





# Appendix 3 FGP Schedule



## Appendix 4 Lessons Learned Template

Project name:			Project number:	
Project manager:			Project sponsor:	

*[Note: Text in red and enclosed in [ ] is explanatory example text and should be deleted]*

ID	Date raised	Event (what happened)	Lesson category	Early warning signs?	Recommendations	Action(s)	Owner	WBS ID	Status
[1]	[mm/dd/yyyy]	[Give a clear detailed description of what happened and the impact. Lessons can be positive as well as negative].	[Positive / negative /	[Note any warning signs that could be picked up in future]	[Recommendation for improvement or to remove the issue for future projects].	[Actions that will be taken to implement the lesson learned]	[Person who will take the action(s)]	[Link to WBS ID if applicable]	[Open / In progress / Closed]

Source: Morphy, T. Stakeholdermap.com © 2008

## Appendix 5 Project Post-Review Template

PROJECT NAME POST IMPLEMENTATION REVIEW

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### 1. BACKGROUND

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#### 1.1 Project Background

<State the key drivers for implementing the project, it's objectives, expected outcomes and deliverables>

#### 2.2 Review Objectives and Scope of Assessment

<State what this document is aimed to accomplish and the project areas examined in the review>

### 2. EXECUTIVE SUMMARY

---

#### 2.1 Overall Assessment

<Provide an overview of whether the project was successful or not in terms of the extent of project achievements and performance of project management>

### 3. PROJECT ACHIEVEMENT ASSESSMENT

---

#### 3.1 Project Outcomes

Project Outcomes	Achievement
Project Objectives	<State the level of achievement>
Benefits	<State the benefits realized from delivery of project>
User Satisfaction	<State user feedback>

#### 3.2 Project Performance

Aspects	Expected Performance	Actual Performance	Reasons for Deviation
Scope	<State deliverables expected>	<State actual outputs delivered>	<Explain reasons for deviation>
Cost	<State expected project costs>	<State actual costs>	<Explain reasons for deviation>
Time	<State expected project completion date and milestone dates>	<State actual completion date>	<Explain reasons for deviation>
Quality	<State expected quality standards>	<State actual quality standards>	<Explain reasons for deviation>

### 4. LESSONS AND RECOMMENDATIONS

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#### 4.1 Lessons

<Provide a summary of what can be done differently to rectify any shortcomings and to improve future delivery of projects. Distinguish between project specific and general lessons >

#### 4.2 Recommendations

<List and describe the measures/actions to be taken in the future to be applied to lessons learned >

## Appendix 6 Philologist Approval

San José, February 09<sup>th</sup>, 2020

Universidad para la Cooperación Internacional (UCI)

To Whom It May Concern:

Natalia Alvarado Mata, identification number 305030705, Bachelor in English with a focus on translation, hereby states that the project titled: **PROJECT MANAGEMENT PLAN FOR THE RIVERBANK RESTORATION PROJECT**, carried out by Rosa M. López Colón, has been revised.

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

Sincerely,

Natalia Alvarado

Natalia Alvarado Mata  
English Translator and Proofreader  
natalia.alvarado@filologos.cr

