UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

Project Management Plan for Affordable Housing in the City of Belmopan

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

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DEDICATION

I dedicate this Final Graduation Project to my mom Joyce Shaw and sister Kandy Shaw. Your unwavering support and dedication during this process will forever be appreciated.

ACKNOWLEDGMENTS

This academic journey has been a catalyst in my life. There were many challenges faced along the way and situations that I believed would hinder me from the inception. However, thanks to some incredible individuals the process was made possible.

Special thank you to my mom and sister for always pushing me supporting me through this process. Envic Castañeda, for his invaluable assistance and support during this Final Graduation Project process and the entire duration of this program, thank you. Thank you for giving me the initial push to get the ball rolling

I am indeed grateful to all those individuals who helped me in any way with this project, including my tutor Mr. Eduardo Lima Calvo and all of the lecturers that influenced my growth during my studies at UCI.

Last, but not least, I would like to thank God for aligning the opportunity to pursue Project Management and realizing its importance in my life.

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ABBREVIATIONS AND ACRONYMS

AH – Affordable Housing

CA – Control Accounts

CPI - Cost Performance Index

CV - Cost Variance

D - Draftsman

DCF - Dria Consultancy Firm

DE-Design Engineer

ES -Electrical Subcontractor

F - Foreman

FGP – Final Graduation Project

FS - Field Superintendent

FSIS - Faux Installation Subcontractor

FSS - Fire and Safety Subcontractor

PMBOK – Project Management Book of Knowledge

PMI - Project Management Institute

PMP- Project Management Plan

PS - Plumbing Subcontractor

RS - Roofing Subcontractor

SPI - Schedule Performance Index

SV - Schedule Variance

TS - Tiling Subcontractor

WBS – Work Breakdown Structure

PEU- Project Execution Unit

WDS - Windows and Doors Subcontractor

EXECUTIVE SUMMARY (ABSTRACT)

While this study looks at the need for affordable housing in the City of Belmopan, we emphasize that housing availability and affordability is a greater issue needing a comprehensive solution. The acute shortage of housing which is affordable to the city's workforce has a direct impact on the economy and the city. The lack of affordable housing is a contributing factor to businesses' struggle to recruit new employees and retain existing employees; the supply of housing is falling far short of the demand and there is little incentive for developers to produce affordable housing either for low-moderate income persons or even for "middle income" persons.

The roots of the affordable housing problem are complex. Dependence upon local property taxes creates a disincentive for those in the community to allow growth which includes families. Local land use regulation and a shortage of developable land create barriers to a logical market response to the demand for new construction.

In the project Dria's Consultancy Firm (DCF) was employed to undertake the rewarding task of providing support for the housing affordability project. The firm first opened its doors in February of 2015. Since then DCF contributed to varied numbers of projects in different regards.

Dria's Consultancy Firm used various project management tools with guidelines required by construction management. Upon having the charter signed, execution was set to begin with a formal project management plan to guide all of the critical aspects of the project's lifecycle. In attempts to successfully deliver the eight-unit, complex housing design project, a project management plan was developed and meticulously executed to ensure maximum fulfilment. The greater objective is to create a project management plan for the project as it fosters affordable housing for the working-class.

The specific objectives were to create a project charter that officially authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the Project Management Plan to develop a scope management plan to ensure that all objectives of the project are maintained during the project lifecycle; to develop a schedule management plan that will aid in the development and management of a

successful project; to create a time management plan which ensures that the project is completed as scheduled; to develop a cost management plan to make sure the project is within budget; to design a quality management plan to make certain that all resources needed to complete the project successfully are available; to develop a human resource plan to ensure that all human resources are identified and effectively managed; to create a communications management plan to ensure that lines of communications and the project performance are properly documented; to develop sustainable procurement management plan for identifying and assigning contracts to suppliers who are able to procure sustainable goods and services; to construct a stakeholder management plan that documents the interaction between stakeholders and processes used to manage issues identified on the project.

The PMP was developed using the *PMBOK® Guide 6th Edition*. This provides a new methodology for the project team to build a more thorough project management plan for a project as important as one as such that is bound make a difference, and to improve the way the company would manage the project. It is recommended that the project team at Dria Consultancy Firm consider the use of the planning process and documents developed during the development of the Project Management Plan to build the housing complex as a foundation for implementing a methodology for similar projects in the future. With all the various elements in place, a successful project was developed.

In conclusion, the knowledge areas outlined in the *PMBOK® Guide 6th Edition* utilized and to create a fully developed project plan. The various areas were integrated for the purpose of the project plan to demonstrate cohesion. The plan creates a method of organization and to assist in producing a project that is successful in customer satisfaction, schedule and budget.

INTRODUCTION

1.1. Background

Access to appropriate, affordable, housing is a fundamental human right, which is essential for individual, family and community wellbeing. While many Belizeans have done well out of the housing market, there is a growing pool of people who cannot access affordable housing.

The housing affordability crisis has been developing for some years and has not been talked about that often nor addressed. One of the biggest problems lower-income Belizean households face today is finding affordable, secure and appropriate housing. While this has been an issue for some time, concerns that the problem has been worsening and affecting moderate as well as low-income households. Home ownership is a dream that every person has, regardless of economic circumstances. On that hand the economic situations are not ideal or encouraging for the taking the risk of homeownership. The high inflations cause a higher cost of living and salaries are stagnant.

This PMP will seek to uncover more details on the issue and ways to penetrate this barrier that many are confronted by. Dria's Consultancy Firm, which has the task to complete the project development plan, will formulate the PMP document to flesh out all details and ideas required to fully grasp the magnitude of the problem and tackle the diverse areas that can be rectified to afford citizens of the City of Belmopan with affordable housing options.

1.2. Statement of the problem

Currently there are not enough affordable housing options offered in the City of Belmopan. This project management plan will look at communicating with those individuals impacted by this crisis and engage best options. The quality of housing is compromised by affordability of the general community. Within this particular project plan, the goal is to conclude the optimal alternative that provides an amicable solution given the allotted time to complete the project. To approach solving this situation, the PMP document is to provide a comprehensive baseline of what has to be achieved by

the project. It solves how the project plan is to be achieved, who will be involved, how it will be reported and measured and how information will be communicate (Slether, 2016). The entire plan takes into account principles of the Project Management Institute (PMI) which has proven guidelines that can be followed to guarantee the success of projects. It should be used as a reference for any decision that is made on the project and for clarification of unclear areas.

1.3. Purpose

City of Belmopan being the capital of Belize, it is sought out as an established center that holds some certainty of employment. Cost of living in the country is on a constant rise and all classes are feeling the pinch of the current economic climate. Many individuals within the city, in attempts to boost their income, are looking into side hustles and various passive income options. One main choice has been property development to provide housing rentals. Though this is seen as an income booster this method is viewed as a quick way out. The job market is not the largest, but with more and more buildings, houses and apartments for rent, many people are living paycheck to paycheck and majority of the available rentals are highly priced which in turn makes it difficult to pay.

The main purpose of the affordable housing project is to foster a conducive option on a small scale to assist those of the working community. Affordable housing in Belmopan with this project is aimed at making it almost impossible to pick out from the other homes and apartments partially because the housing unit is does not look like the rest of the housing in the city. The difference here is in the price per unit. This project will help individuals who are looking for a place to rent that is within budget and flexible to meet their needs.

The PMP is expected to adequately assist the project to navigate smoothly since it will provide all necessary documents required. This research will aim to suggest a set of prominent and realistic recommendations on the improvement of low-cost housing delivery by focusing on the various aspects which influence current housing developments with a general catering. The question being addressed is truly to what

extent is it possible to improve low-cost housing delivery in Belize and what can be done to improve delivery processes and housing quality.

1.4. General objective

To create a project management plan for the project to foster affordable housing for the working-class using income-based rental.

1.5. Specific objectives

1. To create a project charter that officially authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the project management plan.
2. To develop a scope management plan to ensure that all objectives of the project are maintained during the project lifecycle.
3. To develop a schedule management plan that will aid in the development and management of a successful project that is completed on time.
4. To develop a cost management plan to make sure the project is within budget.
5. To design a quality management plan to make certain that all resources needed to complete the project successfully are available.
6. To develop a human resource plan to ensure that all human resources are identified and effectively managed.
7. To create a communications management plan to ensure that lines of communications and the project performance are properly documented.
8. To develop sustainable procurement management plan for identifying and assigning contracts to suppliers who are able to procure sustainable goods and services.
9. To construct a stakeholder management plan that documents the interaction between stakeholders and processes used to manage issues identified on the project.

THEORETICAL FRAMEWORK

2.1. Company/Enterprise framework

2.1.1. Company/Enterprise background

Dria's Consultancy Firm (DCF) is located in Belize City, Belize. The firm carries out independent construction work and produces design plans. Often times the firm has been contracted by various government departments. The strong work and dedication that the firm has stood by has led to its existence for five years and has contributed to the development in countless areas. The owner and key personnel have numerous years of experience in the construction, property development, and management and design of apartment complexes, townhomes and single-family sub-divisions. DCF is the owner, developer, and builder of both family and elderly affordable multi-family housing in Belize. DCF's footprint may expand to other areas in the near future taking on further complex projects.

This PMP will seek to uncover more details on the issue and ways to penetrate this barrier that many any are confronted by. DCF will formulate the PMP to actively carry out all details and ideas required to fully grasp the magnitude of the problem and tackle the various areas that can be rectified to afford the citizens of Belmopan with affordable housing options.

2.1.2. Mission and Vision Statements

Mission

Our mission is to provide residents with exemplary service in a quality home environment, to provide employees unparalleled opportunities or personal and professional development, and to provide partners and clients with maximized real estate asset value. (Dria's Consultancy Firm, 2015)

Vision

To transform the property management industry through commitment to positive change and innovation that redefines the quality and consistency of service that clients can expect from a property manager.

To inspire trust through demonstrated dedication to honesty, integrity and transparency. To grow with, give back to, and act as leaders within our communities all while fostering continued affordable housing.

2.1.3. Organizational Structure

Considering that the Dria's Consultancy has been in operation for five years it has made strides in its quest for continued growth and development. With the years if work that has been attained and the growth that the firm has experienced the organizational struct has also evidently grown. DCF has now included a board of directors with three subdivided subordinate groups, namely, project management infrastructure & service, marketing & business development and finance and organization. Each of those divisions are further divided. The figure below reveals the complete structure of the Firm..

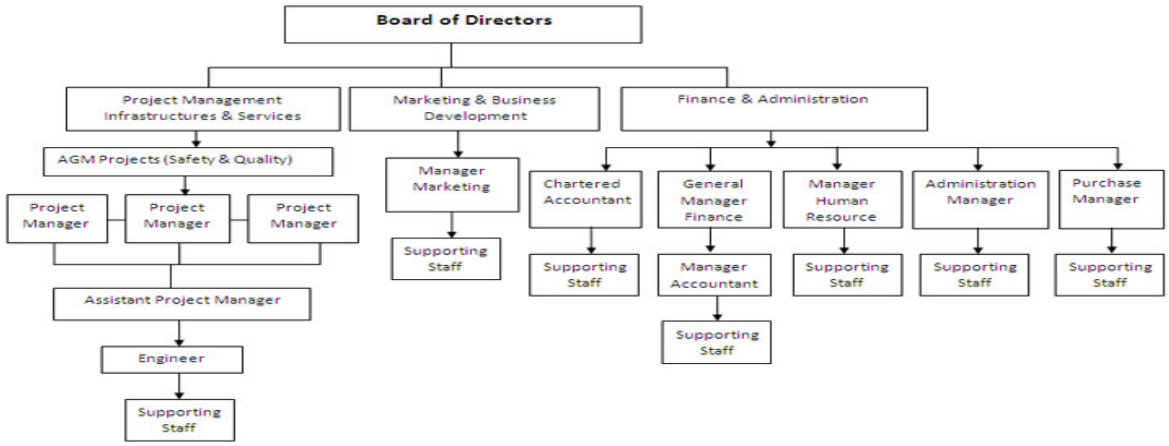


Figure 1: Organizational structure Dria's Consultancy Firm (Mittal & Singh, 2015)

2.1.4. Products offered

Dria's Consultancy Firm prides itself one of the its main services being in project management and the formulation of project management plans. The firm is, however, not limited to solely these methods. DCF specializes in new construction, interior remodels, exterior remodels and building maintenance for retail, offices, financial institutions, healthcare facilities, educational facilities, government properties, warehouses and shipping facilities. In-housework includes, but is also not limited to sidewalks, concrete pads and ramps, framing, drywall, acoustical ceilings, wood trim work, doors, frames, locks, and pallet racking systems. For work not completed in-house, there is an extensive list of qualified contractors. Here are services offered:

- Emergency Services
- Pre-construction Design and Estimating
- Design/Build
- Construction Management
- Construction Services
- Office Buildouts, Renovation and Expansion
- Remodeling
- Building Sustainability
- Upgrades
- Bank Equipment Sales and Installation

2.2. Project Management Concepts

2.2.1. Project

The PMBOK® Guide has defined a project as "A temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2016, p.4)

2.2.2. Project management

According to the PMBOK® Guide Project Management is the "application of knowledge, skills, tools, and techniques to project activities to meet the project requirements." (Project Management Institute, 2016, p.10). Other sources similarly

state that Project Management (PM) is the act of managing all aspects of a project, from team to tasks to tools. This is why project management is important. “Without it, you're consigning your project to chance or chaos, neither of which is ideal. But when you engage in it, there are specific processes and practices that must take place in order for it to be successful.” (Dawson, 2015)

2.2.3. Project life cycle

Collectively, all the phases of a project make up the project life cycle. There are many different project phases and types of project life cycles, depending on the industry and the particular project. DCF has an implement life cycle that will aid in fulfilling the housing project from start to finish. See figure 2:

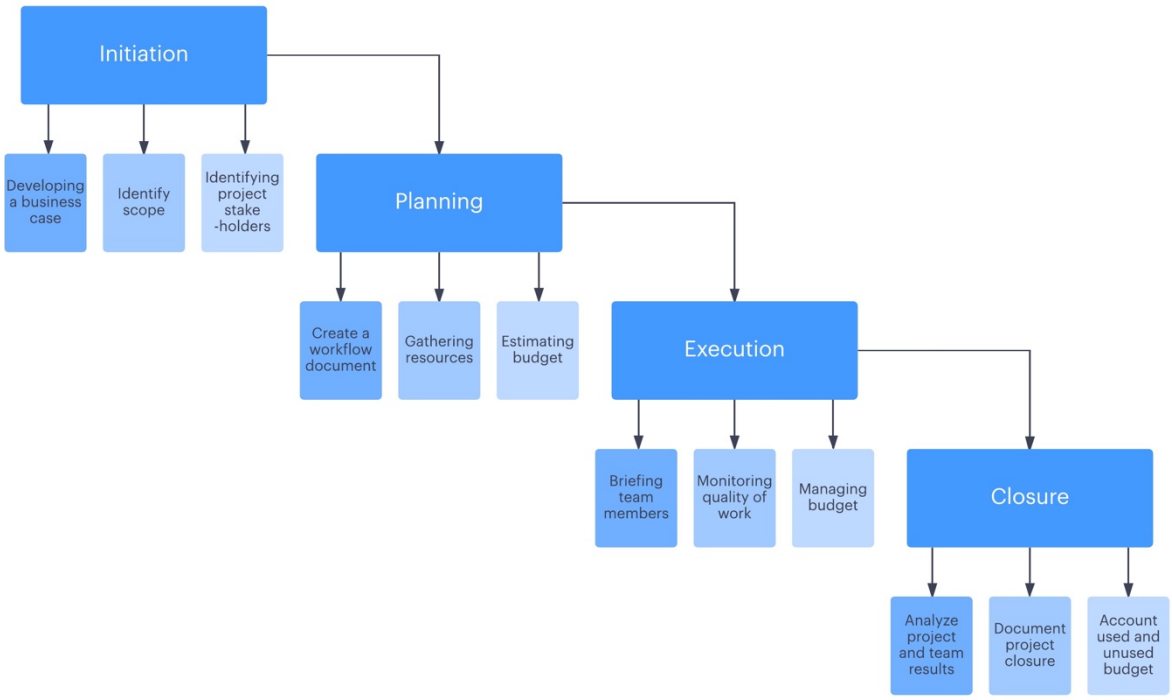


Figure 2: DCF housing project lifecycle (PM Link Charts, 2015)

Below is the typical project life cycle chart.

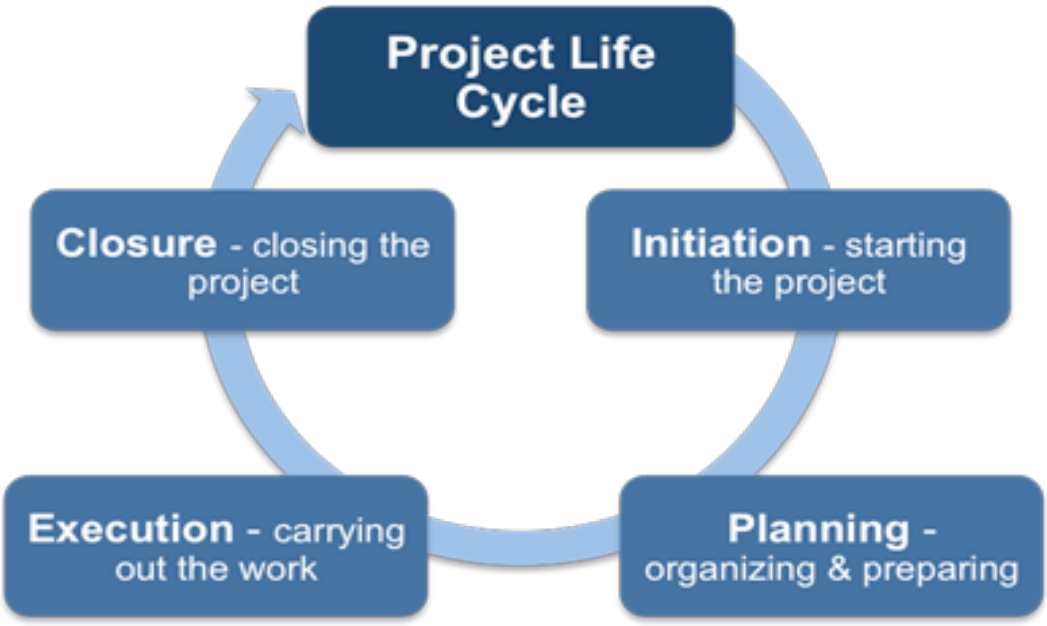


Figure 3: Project life cycle (Sanders & Bright hub, 2017)

2.2.4. Project management processes

The PMBOK Guide 6th Edition (2016) defines project management processes as "a systematic series of activities directed toward causing an end result where one or more inputs will be acted upon to create one or more outputs. This process is useful to the project management plan in allowing proper guidelines to assist in executing the housing project.

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

Figure 4: Project Management Process Groups and Knowledge Area Mapping (PMBOK Guide, 2016)

2.2.5. Project management knowledge areas

Project management knowledge areas cover a lot of ground. It can be intimidating to look at this list of processes and tasks. Implementing these skills into your projects will help to drastically reduce crisis management and move project managers into forward thinking and proactive decision making. And as the project is refined and process iterated, project managers will master the management of projects and the persons involved.

2.2.6 Project Integration Management

Project Integration Management is the umbrella that covers all other project management knowledge areas. It knits together all individual processes and tasks into one project with defined goals and deliverables.

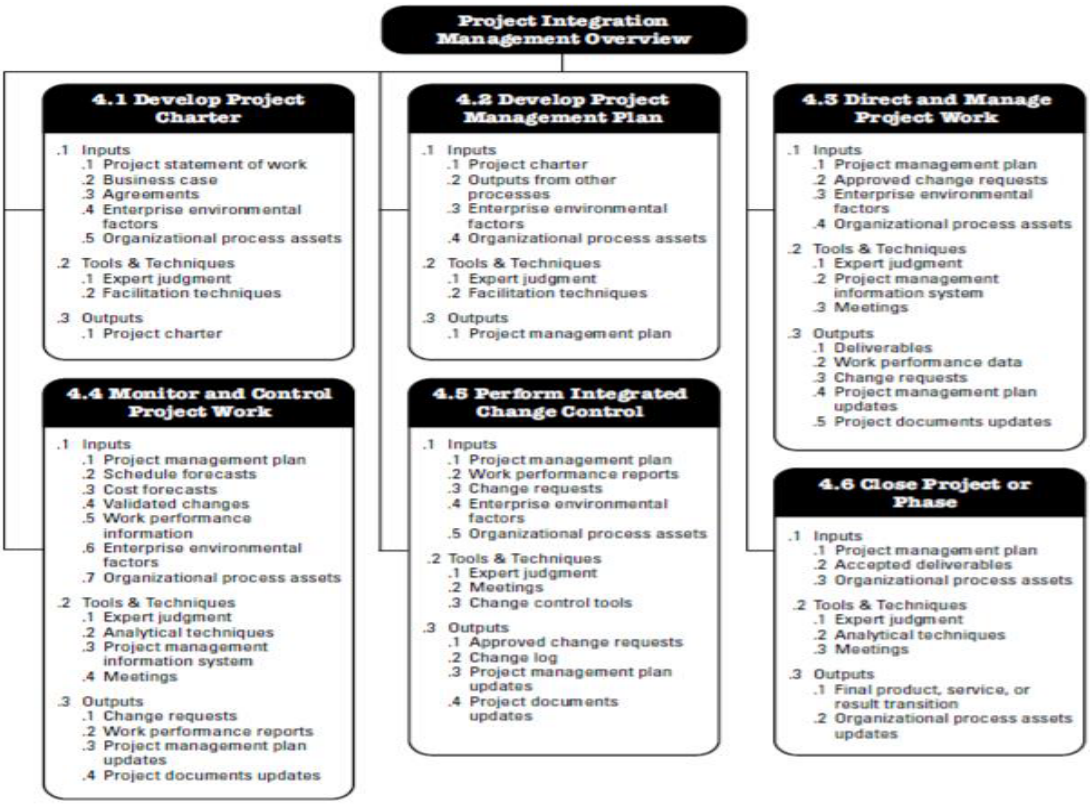


Figure 5: Project Integration Management Overview. (PMBOK® Guide, 2016)

2.2.7 Project Scope Management

Project Scope Management is defined as the knowledge area that “includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully” (Project Management Institute, 2016).

5.1 **Plan Scope Management**—The process of creating a scope management plan that documents how the project scope will be defined, validated, and controlled.

5.2 **Collect Requirements**—The process of determining, documenting, and managing stakeholder needs and requirements to meet project objectives.

5.3 **Define Scope**—The process of developing a detailed description of the project and product.

5.4 **Create WBS**—The process of subdividing project deliverables and project work into smaller, more manageable components.

5.5 **Validate Scope**—The process of formalizing acceptance of the completed project deliverables.

5.6 **Control Scope**—The process of monitoring the status of the project and product scope and managing changes to the scope baseline.

Figure 6: PMBOK® Guide Project Scope Management (2016).

2.2.8. Project Time Management

Time management is the management of the time spent, and progress made, on project tasks and activities. Excellent time management in project management requires the planning, scheduling, monitoring and controlling of all project activities. Time management is one of the six major functions of project management, according to the Project Management Institute. When some people refer to project time management, they're also referring to the tools and techniques used for managing time. (Odom, 2014)

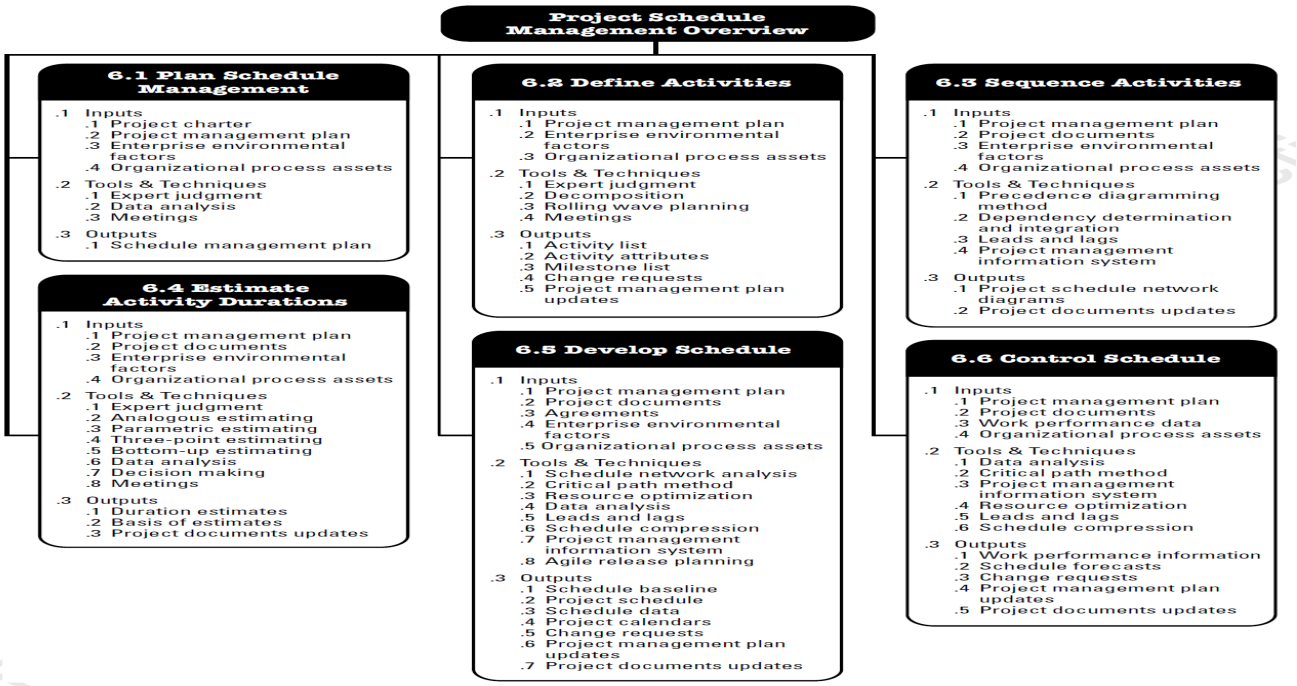


Figure 7: PMBOK® Guide Project Time Management (2016).

2.2.9. Project Cost Management

Cost management is the process of estimating, allocating, and controlling the costs in a project. It allows a business to predict coming expenses in order to reduce the chances of it going over budget. Projected costs are calculated during the planning phase of a project and must be approved before work begins. As the project plan is executed, expenses are documented and tracked so things stay within the cost management plan. Once the project is completed, predicted costs vs. actual costs are compared, providing benchmarks for future cost management plans and project budgets. (Odom, 2014)

7.1 Plan Cost Management—The process that establishes the policies, procedures, and documentation for planning, managing, expending, and controlling project costs.

7.2 Estimate Costs—The process of developing an approximation of the monetary resources needed to complete project activities.

7.3 Determine Budget—The process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.

7.4 Control Costs—The process of monitoring the status of the project to update the project costs and managing changes to the cost baseline.

Figure 8: PMBOK® Guide Project Cost Management (2016).

2.2.10. Project Quality Management

"Project Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken" (Project Management Institute, 2013, p. 227). According to PMI, the processes for the management of Quality are identified in **figure 10** below. Only process 8.1 will be used during project planning to produce the Quality Management Plan that will guide the project's Quality Assurance. (Odom,2014)

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

8.2 Perform Quality Assurance—The process of auditing the quality requirements and the results from quality control measurements to ensure that appropriate quality standards and operational definitions are used.

8.3 Control Quality—The process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes.

Figure 9: PMBOK® Guide Project Quality Management (2016).

2.2.11. Project Human Talent Management

It describes the processes required to make the most use of people involved with the project. It includes the process of identifying project roles, responsibilities, making job descriptions, reporting relationships, staff management plan, confirming HR availability and obtaining them, improving competence, job environment, tracking performance and proving feedback." These all are isolated into 4 processes of project human resource management including plan human resource management, acquire human resource, develop human resource and manage human resource.

9.1 Plan Human Resource Management—The process of identifying and documenting project roles, responsibilities, required skills, reporting relationships, and creating a staffing management plan.

9.2 Acquire Project Team—The process of confirming human resource availability and obtaining the team necessary to complete project activities.

9.3 Develop Project Team—The process of improving competencies, team member interaction, and overall team environment to enhance project performance.

9.4 Manage Project Team—The process of tracking team member performance, providing feedback, resolving issues, and managing changes to optimize project performance.

Figure 10: PMBOK® Guide Project Human Talent Management (2016).

2.2.12. Project Communication Management

According to project management and knowledge article (Bond, 2017), it describes project communication management as “the processes required to ensure timely and appropriate generation, collection, storage, distribution and ultimate disposition of project information. Communication plays a major role in success of any project and it requires strong verbal skills. Project manager must be able to communicate effectively because it’s a greatest threat to the failure of many projects. Project communication management comprises of 3 processes including plan communication management, manage communication and control communication.”

10.1 Plan Communications Management—The process of developing an appropriate approach and plan for project communications based on stakeholder’s information needs and requirements, and available organizational assets.

10.2 Manage Communications—The process of creating, collecting, distributing, storing, retrieving and the ultimate disposition of project information in accordance with the communications management plan.

10.3 Control Communications—The process of monitoring and controlling communications throughout the entire project life cycle to ensure the information needs of the project stakeholders are met.

Figure 11: PMBOK® Guide Project Communication Management (2016).

2.2.13. Project Risk Management

Project management and knowledge article (Bond, 2017) describes project risk management as “the processes concerned with identifying, analyzing and responding to project risks throughout the life of project to meet project objectives. Risk management is all about minimizing the chances of failure. It is a continuous process of identifying and managing uncertain events that can be negative or positive. On the bases of nature and occurrence, risk can be known-unknown and unknown-unknown, and on the bases of sources of occurrence, risk can be internal and external to the project.” There are 6 processes of project risk management including plan risk management, identify risk, perform qualitative risk analysis, perform quantitative risk analysis, plan risk responses and control risks.

11.1 Plan Risk Management—The process of defining how to conduct risk management activities for a project.

11.2 Identify Risks—The process of determining which risks may affect the project and documenting their characteristics.

11.3 Perform Qualitative Risk Analysis—The process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.

11.4 Perform Quantitative Risk Analysis—The process of numerically analyzing the effect of identified risks on overall project objectives.

11.5 Plan Risk Responses—The process of developing options and actions to enhance opportunities and to reduce threats to project objectives.

11.6 Control Risks—The process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project.

Figure 12: PMBOK® Guide Project Risk Management (2016).

2.2.14. Project Procurement Management

Project procurement management is the processes required for acquiring or purchasing the goods, services, material and equipment from outside the performing organization to perform the project work. It also includes contract management and change control system to manage changing in contracts. This knowledge area is carefully integrated with project schedule as failing which delay can occur on project. The four processes that covered under project procurement management are plan procurement management, conduct procurement, control procurement and close procurement.

12.1 Plan Procurement Management—The process of documenting project procurement decisions, specifying the approach, and identifying potential sellers.

12.2 Conduct Procurements—The process of obtaining seller responses, selecting a seller, and awarding a contract.

12.3 Control Procurements—The process of managing procurement relationships, monitoring contract performance, and making changes and corrections as appropriate.

12.4 Close Procurements—The process of completing each project procurement.

Figure 13: PMBOK® Guide Project Procurement Management (2016).

2.2.15. Project Stakeholder Management

Project stakeholder management in accordance with project management and knowledge article (Bond, 2017) is defined as the “processes involved in managing the expectations of those who have some interest in project and that could affect or be affected by project deliverable. Stakeholder management is a process and control that must be planned and guided by primary principles, as it is a critical component to the successful delivery of any project. It is included as a 10th knowledge area in 6th edition of PMBOK”. There are 4 processes of project stakeholder management that includes identify stakeholders, plan stakeholder management, manage stakeholder engagement and control stakeholder engagement.

13.1 Identify Stakeholders—The process of identifying the people, groups, or organizations that could impact or be impacted by a decision, activity, or outcome of the project; and analyzing and documenting relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success.

13.2 Plan Stakeholder Management—The process of developing appropriate management strategies to effectively engage stakeholders throughout the project life cycle, based on the analysis of their needs, interests, and potential impact on project success.

13.3 Manage Stakeholder Engagement—The process of communicating and working with stakeholders to meet their needs/expectations, address issues as they occur, and foster appropriate stakeholder engagement in project activities throughout the project life cycle.

13.4 Control Stakeholder Engagement—The process of monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging stakeholders.

Figure 14: PMBOK® Guide Project Communication Management (2016).

3. Methodological Framework

3.1. Information sources

Sources from which information is gathered is obtained from various outlets. Not all source of information may be deemed credible but does create some foundation on which one can expand. In taking on the PMP for the affordable housing project, DCF will take on sources from different avenues to fulfill the requirement needed for the project.

According to Price (1970) information sources are any system producing information or containing information intended for transmission. For example, in information science, the conventional designation for scholarly documents or publications, which serve not only as important sources but also as the means of transmission of information in space and time.

Information sources are distinguished by the form of representation. This is through textual (books, journals, manuscripts), graphic (graphs, diagrams, plans, charts), and audiovisual (sound recordings, motion pictures, slides). “Different information sources have arisen at various times, but they have all undergone significant evolution in the 20th century. The most important division of information sources was considered to be that into published and unpublished, since ideas and facts were acknowledged as introduced to scholarly use only after their publication, which implied wide dissemination and official registration of the corresponding documents.” (Price, 1970)

3.1.1. Primary sources

Primary sources are the materials on a topic upon which subsequent interpretations or studies are based, anything from firsthand documents such as poems, diaries, court records, and interviews to research results generated by experiments, surveys, ethnographies, and so on. (Roscuzi, 1996) Primary sources are records of events as they are first described, usually by witnesses or people who were involved in the event. Many primary sources were created at the time of the event but can also include memoirs, oral interviews, or accounts that were recorded later.

Visual materials, such as photos, original artwork, posters, and films are important primary sources, not only for the factual information they contain, but also for the insight they may provide into how people view their world. Primary sources may also

include sets of data, such as census statistics, which have been tabulated but not interpreted. However, in the sciences or social sciences, primary sources report the results of an experiment.

It can sometimes be difficult to determine whether a particular source is primary or secondary, because the same source can be a primary source for one topic and a secondary source for another topic. In taking on the PMP primary sources such as meeting minutes, personal interviews, interviews with other stakeholders

3.1.2. Secondary Sources

Secondary sources offer an analysis or a restatement of primary sources. They often attempt to describe or explain primary sources. Some secondary sources not only analyze primary sources, but also use them to argue a contention or persuade the reader to hold a certain opinion. In contrast, to that of a primary source a secondary source of information is one that was created later by someone who did not experience firsthand or participate in the events or conditions you're researching. (University of Illinois Press, 2000). The final graduation project draws sources from historical research project, secondary sources are generally scholarly books and articles.

Table 1: Information sources (Source: K. Shaw)

Objectives	**Information sources**	
	Primary	**Secondary**
To create a project charter that officially authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the project management plan.	Meeting minutes, personal interview with lead project manager (expert)	PMBOK® Guide 6th edition chapter 4
To develop a scope management plan to ensure that all objectives	Meeting minutes, personal interview with lead project	PMBOK® Guide 6th edition chapter 5

of the project are maintained during the project lifecycle.	manager	
To develop a schedule management plan that will aid in the development and management of a success project.	Personal interview with lead project manager	PMBOK® Guide 6th edition chapter 6
To create a risk management plan to identify and examine risks to the successful completion of the project and develops plans to minimize the likelihood of the risks.	Personal interview with lead project manager	PMBOK® Guide 6th edition chapter 11
To develop a cost management plan to make sure the project is within budget.	Personal interview with lead project manager and meeting minutes	PMBOK® Guide 6th edition chapter 7
To design a quality management plan to make certain that all resources needed to complete the project successfully are available.	Personal interview with lead project manager	PMBOK® Guide 6th edition chapter 8
To develop a human resource plan to ensure that all human resources are identified and effectively managed.	Personal interview with lead project manager	PMBOK® Guide 6th edition chapter 9
To create a communications management plan to ensure that lines of communications and the project performance are properly documented.	Personal interview with lead project manager	PMBOK® Guide 6th edition chapter 10
To develop procurement management plan for identifying and assigning contracts to suppliers who are able to procure sustainable goods and services.	Purchasing institutions, personal interviews with lead project manager	PMBOK® Guide 6th edition chapter 12

3.2. Research methods

Research methods have been known to refer to the tools that are employed to do research. These can either be qualitative or quantitative or mixed. Quantitative methods examine numerical data and often requires the use of statistical tools to analyze data collected. This allows for the measurement of variables and relationships between them can then be established. This type of data can be represented using graphs and tables. Qualitative data is non-numerical and focuses on establishing patterns. Mixed methods are composed of both qualitative and quantitative research methods. Mixed methods allow for explanation of unexpected results. (University of Pretoria, May 2019)

3.2.1. Analytical method

An analytical technique (analytical method) is a procedure or a method for the analysis of a problem**,** status or fact**.** Analytical techniques are usually time-limited and task-limited. They are used once to solve a specific issue. Opposed to management methods that affect management of the organization in a longer term.

In practice project managers and analysts use many simple analytical techniques in regular tasks at work which often go without being named. For such techniques, they are often enough just a system of “paper-pencil,” or general office equipment. They are based primarily on the experience of the person who uses them. There are also a number of specialized analytical techniques, which are overwhelmingly based on some mathematical model or which require specific equipment or tools.

Table 2: Research methods (Source: K. Shaw, 2019)

Objectives	**Research methods**
	Analytical Method

To create a project charter that officially authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the project management plan.	The analytical method will be implemented by using facts and information from the sources identified in Chart 1 objective 1 above, to propel the creation of the project charter.
To develop a scope management plan to ensure that all objectives of the project are maintained during the project lifecycle.	The analytical method will be employed through the use of facts or information from the sources identified in Chart 1 objective 2 above, to prompt decision making when creating the documents which include the scope management plan.
To develop a schedule management plan that will aid in the development and management of a success project.	The analytical method will be employed by using information from the sources identified in Chart 1 objective 3 above, to drive decision making when creating the documents that include the time management plan.
To create a risk management plan to identify and examine risks for the successful completion of the project and develop plans to minimize the likelihood of the risks.	The analytical method will be employed by using information derived from the sources identified in Chart 1 objective risk management, to motivation decision making when creating the documents that will comprise the risk management plan.
To develop a cost management plan to make sure the project is within budget.	The analytical method will be employed by using information from the sources identified in Chart 1 objective cost management, to drive decision making when creating the documents that will comprise the cost management plan.
To design a quality management plan to make certain that all resources needed to complete the project successfully are available.	The analytical method will be employed by using information from the sources identified in Chart 1 objective 5 above, to drive decision making when creating the documents that will comprise the quality management plan.
To develop a human resource plan to ensure that all human resources are identified and effectively managed.	The analytical method will be employed by using information derived from the sources identified in Chart 1 objective human resources, to motivation

	decision making when creating the documents that will comprise the human resource management plan.
To create a communication management plan to ensure that lines of communications and the project performance are properly documented.	The analytical method will be employed by using information derived from the sources identified in Chart 1 objective communication management, to drive decision making when creating the documents that will comprise the communications management plan.
To develop sustainable procurement management plan for identifying and assigning contracts to suppliers who are able to procure sustainable goods and services.	The analytical method will be employed by using information derived from the sources identified in Chart 1 objective procurement management, to motivation decision making when creating the documents that will comprise the procurement management plan.
To construct a stakeholder management plan that documents the interaction between stakeholders and processes used to manage issues identified on the project.	The analytical method will be employed by using information derived from the sources identified in Chart 1 objective stakeholder management, to drive decision making when creating the documents that will comprise the stakeholder management plan

3.3. Tools

According to the PMBOK® Guide, a tool is defined as “something tangible, such as a template or software program, used in performing an activity to produce a product or result” (Project Management Institute, 2013, p. 565). Some of these tools will be used while carrying out the final graduation project in fulfillment of the PMP for the affordable housing project. Below are a few tools that can be used in the process:

- Project charter template
- Work Breakdown Structure (WBS)

- Requirements Management Plan
- Requirements documentation template Scope Management
- Plan Project Management
- Plan template Schedule Management
- Plan template Scheduling tool Activity List template
- Cost Management Plan template
- Project Budgeting template Cost Baseline template
- Quality Management Plan template
- Quality Management tools
- Human Resource Management Plan
- Communications Management Plan template
- Communication Risk Management Plan and Risk Register template
- Procurement Management Plan template
- Stakeholder Management Plan template
- Stakeholder Analysis Chart
- Stakeholder Register template
- Stakeholder Engagement Assessment Matrix

Table 3: Tools (Source K. Shaw, 2019)

Objectives	**Tools**
To create a project charter that officially authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the project management plan.	Project Charter template and Project Management Plan template
To develop a scope management plan to ensure that all objectives of the project are	Traceability matrix template, Microsoft Vision Professional 2016, Document template,

maintained during the project lifecycle.	Management Plan template, Work Breakdown Structure generator, and Scope Management Plan template
To develop a schedule management plan that will aid in the development and management of a success project.	Schedule Management Plan template, Projectlibre, Microsoft Visio Professional 2016, and Activity List template
To create a risk management plan to identify and examine risks for the successful completion of the project and develop plans to minimize the likelihood of the risks.	Risk Management Plan template, and Risk Register template
To develop a cost management plan to make sure the project is within budget.	Cost Management Plan template, Microsoft Excel 2016 Project Budgeting template, and Cost Baseline template.
To design a quality management plan to make certain that all resources needed to complete the project successfully are available.	Quality Management Plan template and Quality Management tools (Check sheets)
To develop a human resource plan to ensure that all human resources are identified and effectively managed.	Human Resource Management template and Responsibility Assignment Matrix
To create a communications management plan to ensure that lines of communications and the project performance are properly documented.	Communications Management Plan template as well as Communications Matrix
To develop sustainable procurement management plan for identifying and assigning contracts to suppliers who are able to procure sustainable goods and services.	Procurement Management Plan
To construct a stakeholder management plan that documents the interaction between stakeholders and processes used to manage issues identified on the project.	Stakeholder Management Plan template, Stakeholder Analysis Chart, Microsoft Excel 2016, Stakeholder Register template, Stakeholder Engagement Assessment Matrix, Stakeholder Power/Interest Grid Creator

3.4. Assumptions and constraints

"An assumption is a belief of what you assume to be true in the future. You make assumptions based on your knowledge, experience or the information available on hand. These are anticipated events or circumstances that are expected to occur during your project's life cycle. Assumptions are supposed to be true but do not necessarily end up being true; Sometimes, they may turn out to be false, which can affect your project significantly. They add risks to the project because they may or may not be true." (Usmani, 2019)

"Constraints are limitations imposed on the project, such as the limitation of cost, schedule, or resources, and you have to work within the boundaries restricted by these constraints." (Usmani, 2019). All projects have constraints, which are defined and identified at the beginning of the project. The PMBOK Guide recognizes six project constraints: scope, quality, schedule, budget, resource, and risk. Out of these six, scope, schedule, and budget are collectively known as the triple constraints. Identifying assumption and constraints will help the overall project management plan for the housing project by aiding the team to be conscious of the project possibilities.

Table 4: Assumptions and constraints (Source: K. Shaw, 2019)

Objectives	Assumptions	Constraints
To create a project charter that officially authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the project management plan.	Funding for the project will be disbursed upon a completed and signed project charter.	There are only few days allocated to create the project charter. Also, stakeholder identification is scheduled to occur at the same time as the development of the project charter.
To develop a scope management plan to ensure that all objectives of the project are maintained during the	The client has disclosed all of the information required to develop the	The client considering modifying the project scope during the

Objectives	Assumptions	Constraints
project lifecycle.	scope.	project.
To develop a schedule management plan that will aid in the development and management of a success project.	The time allotted for the development of the Project Management Plan and construction of the units	The time allotted for the construction of the housing units may not exceed 18 months.
To create a risk management plan to identify and examine risks for the successful completion of the project and develop plans to minimize the likelihood of the risks.	There is sufficient information required to adequately identify most, if not all, project risks.	All of the project risks need to be identified within the planning phase (stage) or as early as possible.
To develop a cost management plan to make sure the project is within budget.	The budget created during planning will accurately depict the financial resources required to build the housing units	The budget for the building of the housing complex must not exceed $600,000 thousand.
To design a quality management plan to make certain that all resources needed to complete the project successfully are available.	The quality management plan will categorize all of the technical and managerial quality requirements of the project.	The quality constraints require that the structure is able to withstand natural disaster. Also, to be built with the best materials and will maintaining affordability of the end product.
To develop a human resource plan to ensure that all human resources are identified and effectively managed.	The consultancy firm has adequate human resources to complete the project. The team development plans for the project team and subcontractors will be sufficient to begin the	Only human resources identified and planned for will be included in the budget. The main hours and overtime hours are set.

Objectives	Assumptions	Constraints
	construction of the housing units on time.	
To create a communications management plan to ensure that lines of communications and the project performance are properly documented.	The organization has the technology required to suffice the communication needs of all stakeholders	The availability of electricity and consistency of internet access must be dependable.
To develop sustainable procurement management plan for identifying and assigning contracts to suppliers who are able to procure sustainable goods and services.	The company have identified an initial list of suppliers.	The list of suppliers needs to be thorough. The use of international suppliers should not compromise schedule.
To construct a stakeholder management plan that documents the interaction between stakeholders and processes used to manage issues identified on the project.	The stakeholder management plan will include a complete list of all stakeholders involved and a plan and how to properly manage each.	The information required to plan and manage stakeholders must be accurate.

3.5. Deliverables

A deliverable is defined as “any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project” (Project Management Institute, 2016, p. 4). Deliverable will help the FGP in having specific target to be met.

Table 5: Deliverables (Source: K, Shaw)

Objectives	Deliverables
To create a project charter that officially authorizes the project and provides the project manager with the authority to apply	Project Charter

organizational resources to the project in order to produce the project management plan.	
To develop a scope management plan to ensure that all objectives of the project are maintained during the project lifecycle.	Scope Management Plan, Requirements Management Plan, Requirements Document and Requirements Traceability Matrix
To develop a schedule management plan that will aid in the development and management of a success project.	Schedule Management Plan, Activity List, Schedule Network Diagram, Resource assignments and activity durations, and Schedule in Gantt chart
To create a risk management plan to identify and examine risks for the successful completion of the project and develop plans to minimize the likelihood of the risks.	Risk Management Plan and Risk Register
To develop a cost management plan to make sure the project is within budget.	Cost Management Plan, Cost Baseline and Project Funding Requirements
To design a quality management plan to make certain that all resources needed to complete the project successfully are available.	Quality Management Plan
To develop a human resource plan to ensure that all human resources are identified and effectively managed.	Human Resource Management Plan
To create a communications management plan to ensure that lines of communications and the project performance are properly documented.	Communication Management Plan and Communications Matrix
To develop sustainable procurement management plan for identifying and assigning contracts to suppliers who are able	Procurement Management Plan

to procure sustainable goods and services.	
To construct a stakeholder management plan that documents the interaction between stakeholders and processes used to manage issues identified on the project.	Stakeholder Management Plan, Stakeholder Analysis Chart, and Stakeholder Register

RESULTS

4.1. Project Integration

In developing the Project Management Plan for the building of the housing complex, a project charter, specific objective one (1), was the first process in the Project Integration Management knowledge area. This was accomplished using interviews, meeting minutes and the *PMBOK® Guide* as sources. These were then used as the decision-making drivers together with the application of the analytical research methodology.

4.2. Scope Management plan

4.2.1. Introduction

The Scope Management Plan will provide a basic scope framework for DCF Affordable Housing project. The scope management approach, roles and responsibilities as they pertain to project scope, scope definition, verification and control measures, scope change control, and the project's work breakdown structure will all be documented. Project communications which relates to the project's scope should follow to the Scope Management Plan. This implementation will create a new avenue for citizens to have the benefit of quality housing at an affordable price.

4.2.2. Scope Management Approach

For DCF Affordable Housing, scope management obligations fall on the Project Manager. The task at hand is characterized by the Scope Statement, Work Breakdown Structure (WBS) and WBS Dictionary. The Project Manager, Sponsor and Stakeholders will set up a favored documentation for estimating venture scope which incorporates deliverable quality agendas and work execution estimations. Proposed scope changes might be started by the Project Manager, Stakeholders or any individual from the task group. All change solicitations will be submitted to give gauge and assess effect to timeline and expenses in the event that any changes are made.

4.2.3 Roles and Responsibilities

The Project Manager, Sponsor and undertaking group will all assume key jobs in dealing with the extent of this venture. In that capacity, the Project Sponsor, Project Manager, and colleagues must know about their obligations so as to guarantee that work performed on the venture is inside the built-up scope all throughout the span of the task. The table below characterizes the jobs and duties of the executives of DCF Affordable Housing.

Role	Description
Project Sponsor	Provides executive team approval and sponsorship for the project. Has budget ownership for the project and is the major stakeholder and recipient for the project deliverables.
Project Manager	Gives by and large administration to the project. Responsible for setting up a Project Charter, creating and dealing with the work plan, verifying suitable assets and appointing the work and guaranteeing fruitful consummation of the task. All task colleagues report to the venture director. Handles all task managerial obligations, interfaces to extend supporters and proprietors and has in general responsibility for the undertaking
Steering Committee	Give help with settling issues that emerge past the undertaking supervisor's purview. Screen venture advance and give vital apparatuses and bolster when achievements are in risk.
Stakeholder	Key provider of requirements and recipient of project deliverable and associated benefits. Deliverables will directly enhance the stakeholders' business processes and environment. Majority of stakeholders for this project will be agency leads and project management representatives.
Team Members	Working project team members, who analyze designs and ultimately improves or replaces the business processes. This includes collaborating with teams to develop high level process

	designs and models, understanding best practices for business processes and partnering with team members to identify appropriate opportunities, challenging the old rules of the business and stimulating creating thinking, and identifying organizational impact areas.

Table 6: Roles and Responsibilities (Source: K. Shaw, 2020)

4.2.4. Scope Definition

The scope for DCF Affordable Housing will be characterized through a far-reaching necessities assortment process. Complete examination will be performed of all changed task agreements and meeting minutes, construction laws, proprietors' prerequisites and documentation comparative with industry principles were finished. From this information, the project manager will able to develop the requirements management plan, requirements documentation for the building specifications.

The scope depiction and expectations will progress dependent on the need assortment procedure and contribution from specialists Contractor, Sub experts, Subcontractors, Environmental Agencies and Governmental Regulatory Agencies. The procedure of master judgment gives input on the best, safe and cost-proficient approaches to meet the necessities of building a sound and moderate housing complex that executes maintainable procedures and objectives.

Details

- Lot size of .54 acre (23,694 sf)
- Lot currently used as a parking lot
- Owned by Belmopan City Council
- Allows for multifamily which is highest & best used
- Development program for a 2 story, 8-unit apartment building where units are approximately 1,050 sf

This particular site is to develop an 8-unit apartment building that is 2 stories high with 4 units per floor because of the tight building envelope. Each unit will be approximately 1,050 sf and will be comprised of 2 bedrooms and 1 full bathroom. The building will feature only staircase access. The building will be constructed with a slab on the 1st floor. A basement is not going to be provided as it would raise the construction costs by $80 per square foot, approximately.

All units will feature 9-foot ceiling heights with an open floor plan having the kitchen area overlooking into the living area. Based on the wants and needs of today's renters, other amenities to be provided in each unit include a washer and dryer and a walk-in closet in all master bedrooms. All apartments will be finished with modern looking kitchens. Kitchens will have four recessed lights, black appliances, tile floor, 40" cabinets along with sleek countertops. As the project would be contracted by DCF, they can manage costs and have the ability to spend extra time finding suppliers that offer products at reasonable prices.

DCF is making priority to incorporate green building techniques and products into the construction of the building. Although building green is not required, it would be preferred to build under that label which would help with marketing and goodwill of the property. All units of the building would have high efficiency HVAC systems at a minimum rating of 90% efficient. High efficiency tankless hot water heaters will be installed. Tankless hot water heaters have come down in cost where they are only a little more than a typical hot water tank. Even though they may be a little more costly than other systems, a tankless hot water heater will provide the tenant with lower energy costs which would hopefully help with the marketing and lease up of the units.

4.2.5. Project Scope Statement and Scope Exclusion

The project scope gives a detailed portrayal of the task, expectations, requirements, avoidances, suppositions, and acknowledgment criteria. Moreover, the extension proclamation incorporates what work ought not to be performed so as to eliminate any suggested yet pointless work which falls outside the project scope.

In completion of the project scope DCF will only adhere to stated specifications requested by the project sponsor. Task outside the scope of work will not be carried out. Among those are:

DCF will not be responsible for the building electrical plans as the sponsor has designated the task to a versed electrical entity. DCF carries no responsibility for the marketing and recruiting of the completed project. The firm will also not be responsible for landscaping and on the exterior of the complex.

4.2.6. Work Breakdown Structure

In order to effectively manage the work required to complete this project, it will be subdivided into individual work packages. This will allow the Project Manager to effectively manage the project's scope as the project team works on the tasks necessary for project completion. The project is broken down into six phases: the initiation phase, the design phase, preconstruction phase, construction phase, the post construction phase and the project closure phase. Each of these phases is then subdivided further down to work packages.

4.2.7. Scope Verification

As the housing project advances, the Project Manager will confirm interval deliverables expectation against the first extension as characterized in the initial scope statement, WBS and WBS Dictionary. When the Project Manager confirms that the scope meets the requirements characterized in the project plan, the Project Manager and Sponsor will meet for formal acknowledgment of the deliverable. During this gathering the Project Manager will show the deliverable to the Project Sponsor for formal acceptance. The Project Sponsor will acknowledge acceptance of the deliverable by marking a task deliverable acknowledgment archive. This will guarantee that the scope of work stays inside the extent of the venture on a predictable premise for the duration of the life of the task.

Milestone	In Scope	Out Scope	Date	Deliverable

Figure 15: Milestone template for project scope (Source: PM international, 2015)

The Project Manager and the project team will cooperate to control of the scope of the housing project. The team will use the WBS Dictionary as an announcement of work for every WBS component. The project team will guarantee that they perform just the work portrayed in the WBS word reference and produce the characterized expectations for every WBS component. The Project Manager will direct the undertaking group and the movement of the venture to guarantee that this degree control process is pursued, and progress is accounted for through Project Scope estimation instruments.

4.2.8. Scope Change

If a change in the scope of the housing project is required, the process should be followed to recommend and estimate changes in the scope of the project. Any member of the project team or sponsor can request changes in the scope of the project. All change requests must be sent to the project manager in the form of a project change request document. The project manager will then review the modification suggested as part of the project. The Project Manager will reject the change request if it does not apply to the intent of the project or call a change control meeting between the project team and the sponsor to review the change request and conduct an assessment of the impact of change. If the change request receives initial approval from the project manager and sponsor, the project manager will formally submit the change request to the change control committee. If the change control committee approves the change in scope, the project sponsor will formally accept the change by signing the project change control document. Once the Change Control Committee and the Project Proponent have accepted the scope change, the Project Manager will update all project documents and communicate the scope change to all interested members of the project team.

Affordable Housing Project		
WBS ID	**Activity (Level 2)**	**Activity (Level 3)**
1	Preliminary	1.1 Receive notice to proceed and sign contract 1.2 Submit bond and insurance documents 1.3 Prepare and submit project schedule 1.4 Prepare and submit schedule of cost 1.5 Obtain building Permits 1.6 Submit monthly requests for payment

2	Long Lead Procurement	2.1 Order long lead items – Roofing 2.2 Order long lead items – Seating 2.3 Order long lead items – Plumbing 2.4 Order long lead items – Electric
3	Temporary Facilities & Services	3.1 Install Temporary Services 3.2 Set up site office 3.3 Setup Temporary Shelters 3.4 Prepare Site – lay down yard and temporary fencing 3.5 Clear and grub site 3.6 Stone site access and temporary parking area 3.7 Rough grade site (cut and fill) 3.8 Install storm drainage 3.9 Erect building batter boards and layout building
4	Foundation and ground floor	4.1 Excavate foundations Trenches 4.2 Install waterproofing, Drains, Reinforcement and Services 4.3 Pour column and foundations 4.4 Cure foundations 4.5 Strip column and foundation forms
5	Ground Floor Walls and Openings	5.1 Erect rebars for block work 5.2 Lay Blocks with opening for walls 5.3 Fabricate and erect rebars for columns and beam 5.4 Form and pour columns & beams 5.5 Cure Columns & Beams 5.6 Strip forms from Column & Beams
6	Form and Pour Concrete for 1st floor	6.1 Form 1st floor 6.2 Install electrical underground 6.3 Install plumbing underground 6.4 Install rebar and in-floor utilities 6.5 Pour 1st floor slab 6.6 Cure 1st floor slab 6.7 Strip forms from 1st floor slab
7	First Floor Walls and Openings	7.1 Erect rebars & lay block with openings 7.2 Form and pour Columns & Beams 7.3 Cure and strip Columns & Beams
8	Masonry work	8.1 Install exterior masonry stonework 8.2 Construct manholes, septic tanks and waste chambers 8.3 Rough-in Plumbing in Toilet and Kitchen 8.4 Lay and clean tiles in bathrooms and kitchen
9	Roofing	9.1 Install roofing structure, finishing and flashing at parapet walls 9.2 Install roof drains and guttering
10	Windows and Doors	10.1 Install windows and Hardware 10.2 Install interior doors and hardware

11	Building finishes	11.1 Plastering of walls 11.2 Paint walls and woodwork 11.3 Install conduit at ceiling space 11.4 Install ceiling grid 11.5 Install ceiling tile 11.6 Install cabinets in kitchen and bathrooms 11.7 Install hardware and accessories 11.8 Complete interior and exterior plantings 11.9 Pave, curb and stripe parking lot
12	Plumbing	12.1 Rough-in plumbing in block walls 12.2 Sitting of external Waste pipes 12.3 Set plumbing fixtures and trim 12.4 Flush, test and clean piping fixtures
13	Electrical	13.1 Rough-in electrical in masonry walls 13.2 Pull wire in conduit and set area transformers 13.3 Install and terminate electrical devices 13.4 Install light fixtures- test and clean
14	Final Clean-up and Occupancy	14.1 Install non-slip ceramic tile flooring in main areas 14.2 Clean tile floors 14.3 Remove debris from building and do final clean-up 14.4 Substantial completion date
15	Complete Final Inspections	15.1 Complete punch list items from all inspections 15.2 Obtain certificate of occupancy 15.3 Issue final completion documents including warranties 15.4 Issue final request for payment

Figure 16: Activity List (Source: Shaw, Kamisha 2020)

4.2.10. Work Breakdown Struct

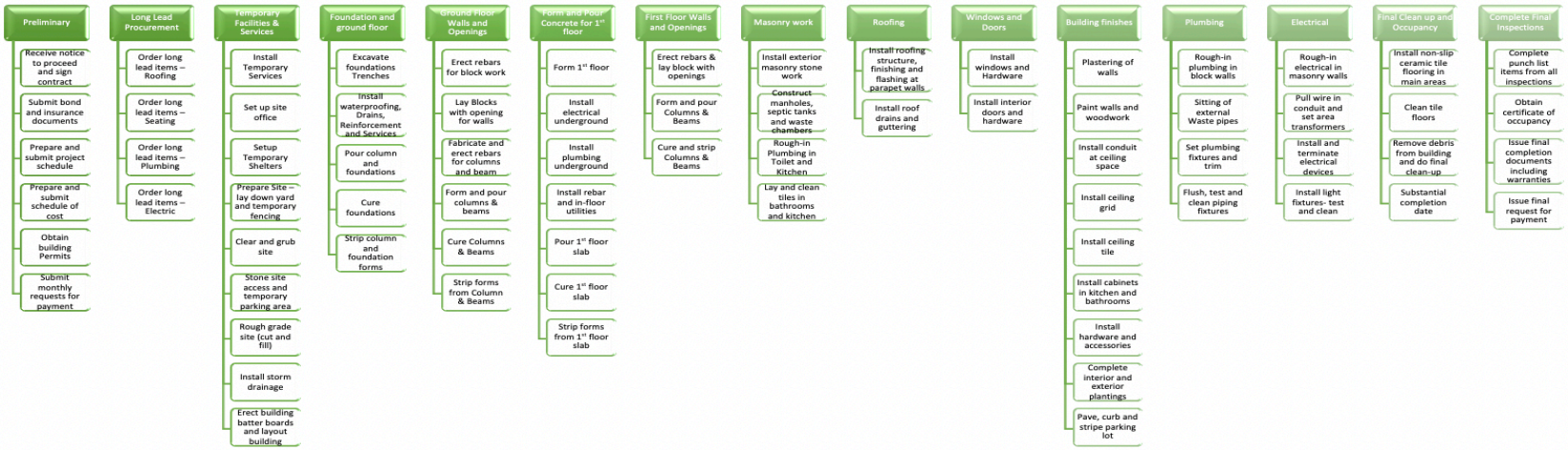


Figure 17: Work Breakdown Structure (Source: Compliled By Author)

4.2.11. Acceptance

Approved by:

_____ Date: _____

<Approvers Name>
[Project Name] Executive Sponsor

_____ Date: _____

<Approvers Name>
[Project Name] Business Sponsor

_____ Date: _____

<Approvers Name>
DCF Project Manager

_____ Date: _____

<Approvers Name>
[Project Name] Stakeholder

Figure 18: Acceptance Template (Source: PM International, 2015)

Required Traceability Matrix

Project Name	Affordable Housing in the City of Belmopan						
Project Manager	Kamisha Shaw						
Project Description	Project will present a project plan for the erection of a housing complex with goal of providing resident with comfortable and affordable living arrangement.						
ID	WBS ID	Customer needs	Functional Requirements	Technical Assumptions	Design Document	Priority	Verification
001	1.2.1	Building is laid out to	Use surveyors	Plan indicates	Site plan and	High	

		obtain the maximum property use	plan to locate building on site. Use surveyor's plan to produce architectural design	location of the building on proposed construction site.	analysis		
002	1.2.1	Use existing property	Surveyor to provide proper surveyor's drawings to Architect and Owner	Building must be within the commercial zoning area	Location plan	High	
003	1.2.3	Building needs to be built in accordance to builder code in Belmopan	Use concrete stilts to lift building	Building must be built with all guidelines the Belmopan City Council in mind	Blueprint and building permits	High	
004	1.2.5	Structural steel frame to reduce building Cost	Find steel building fabricators to produce steel frame			High	
005	1.2.4	Building is built with structural integrity	Enlist the services of a structural engineer	All structural engineering must confirm to the "Belmopan building code" and the AISC standards.	Complete structural drawings	High	
006	1.2.6	Must have electricity	Enlist the services of an electrical engineer	Electrical receptacles, switches, circuit breakers, size of	Electrical layout and schedules	High	

				wires, electrical fixtures, size of conduits and the amount of electrical demand load required to run the building			
007	1.2.3	Quality detailed finishes, especially wood and interiors	Enlist the services of an Architect	Detail various building components and how they are constructed	Architectural details	High	
008	1.2.5	Quality detailed finishes, especially wood and interiors	Enlist the services of an Architect	Building must adhere to local building co	Interior Design Layout	High	

Figure 19: Required Traceability Matrix (Source: Compliled By Author)

4. 4.3. Schedule Management Plan

The planning processes of the project schedule management will be carried out after the Project Scope and Cost Management. The first process in project time management will be to develop the Schedule Management Plan that would be used to guide the life cycle of the project schedule. The Project Charter and the Scope Management Plan were used as inputs to this process to gather information on the Scope Baseline and the summarized milestone schedule. The tools and techniques used were expert judgment, analytical techniques and meetings to create the Schedule Management Plan. The schedule and project budget will be closely evaluated. As the project progressed the s curve will be fulfilled.

4.3.1. Introduction

The project schedule will be guided on how the project will be completed. The calendar and Gantt are essential parts of this project as it provides the project team and the sponsor with a visual image of the project's position at a given time. The calendar management plan is used to define the technique that the project team will use to create the project calendar. This plan also includes how the team will review the project schedule and manage changes after approval of the standard schedule. This includes identifying, analyzing, documenting, prioritizing, approving or rejecting and publishing all schedule-related changes.

4.3.2. Schedule Management Approach

Project schedules are run with ProjectLibre. The activity definition specifies the specific work packages that must be run to complete the individual services. The order of activities is used to determine the order of work packages and to affect the relationships between project activities. The estimated duration of the activity is used to calculate the number of work periods required to complete the work packages. Resource estimation is used to allocate resources to work packages in order to complete calendar development.

Once an initial schedule has been established, the project manager and the assistant project manager review it carefully to review the tasks assigned to the project. The project team and resources must accept the tasks, deadlines and schedules proposed for the work package.

Once this objective has been reached, the project sponsor examines and approves the calendar and is baselined.

4.3.3 Roles and Responsibilities

The project manager will be responsible for simplifying the breakdown of work packages into activities that provide a basis for sequencing and estimating duration and resources with the project team. The project manager will also create the project schedule using ProjectLibre and validate the schedule with the project team, and stakeholders. The project manager will obtain schedule approval from the stakeholders and baseline the schedule. The project team is responsible for participating in work, and duration and resource estimating. The project team will also review and validate the proposed schedule and perform assigned activities once the schedule is approved. The project stakeholders will participate in reviews of the proposed schedule, assist in its validation and approve the final schedule before it is baselined.

4.3.4. Schedule Control

The project schedule will be revised and updated as necessary when information is added or omitted. It will include the actual start and finish of the completion. The project manager is responsible for holding schedule updates or review meetings and determining of schedule modifications. Submitting schedule change requests and reporting schedule status in accordance with the project's communications plan will be left to the project manager.

The project team is responsible for participating in schedule updates or review meeting sessions. The team must communicate any changes of the actual start/finish dates to the project manager. To conclude, the team will participate in schedule variance resolution activities as needed. The project stakeholder(s) will maintain awareness of the project schedule status and review/approve any schedule change requests submitted by the project manager.

4.3.5. Develop Schedule

In this section, all prior time management processes are integrated so as to reflect the intended project schedule for DCF. The sequenced activity list, and duration estimates will be approved for the timely execution of project tasks over time. Schedule compression techniques will be used, and a few activities have been slotted for simultaneous completion with buffer periods for completion in each instance. This adaptation is hereby applied to ensure reduction in instances of negative variances in schedule compliance.

The schedule includes project milestones and that will form the basis for comparison between actual and planned project schedule results.

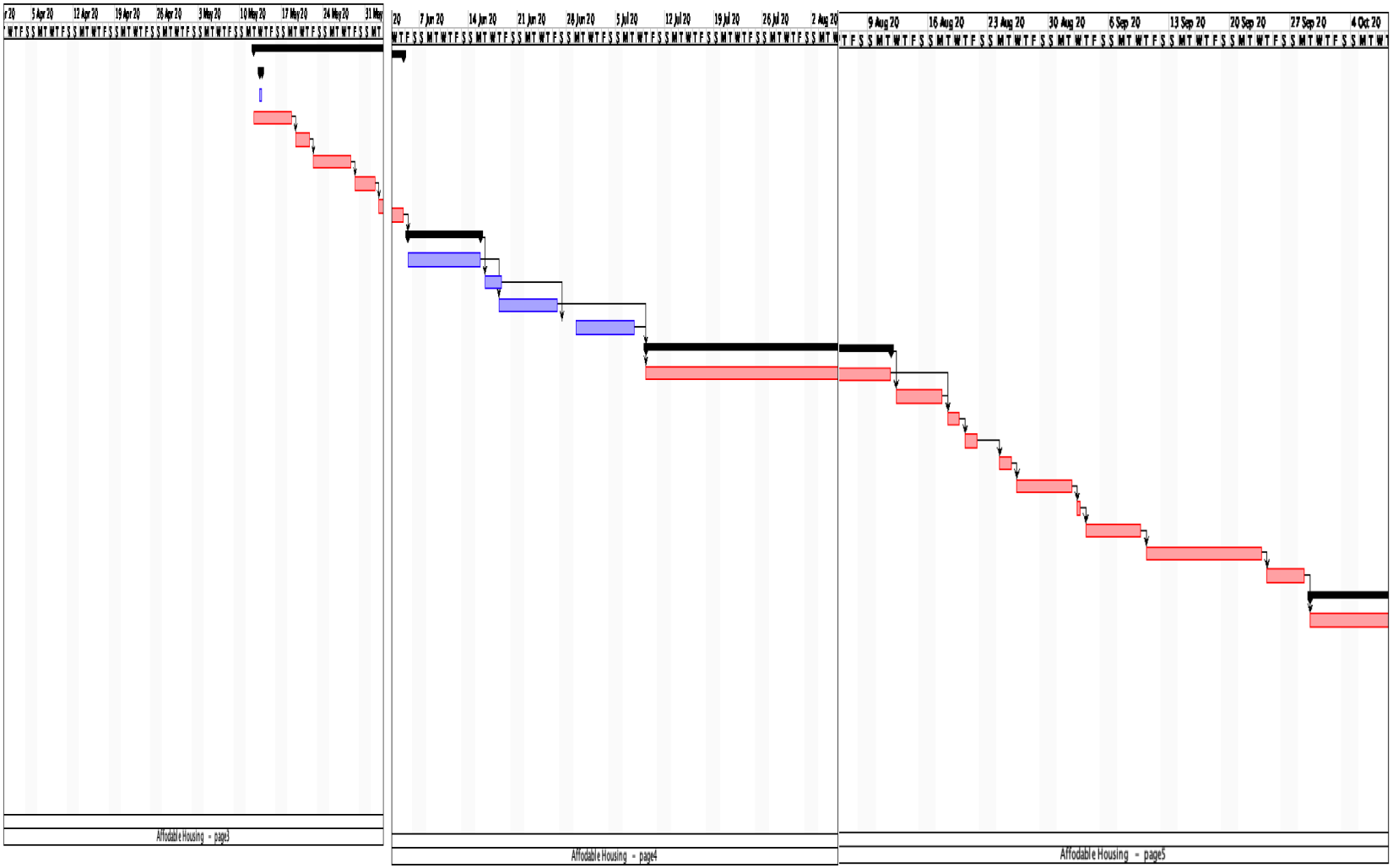
	Name	Duration	Start	Finish
1	**Housing Project**	18 days?	5/12/20 8:...	6/4/20 5:00 PM
2	**Prliminary**	1 day?	5/13/20 8:...	5/13/20 5:00 PM
3	Receive notice to proceed and sign contr	1 day?	5/13/20 8:...	5/13/20 5:00 PM
4	Submit bond and insurance documents	5 days	5/12/20 8:...	5/18/20 5:00 PM
5	Prepare and submit project schedule	3 days?	5/19/20 8:...	5/21/20 5:00 PM
6	Prepare and submit schedule of cost	5 days?	5/22/20 8:...	5/28/20 5:00 PM
7	Obtain building Permits	2 days?	5/29/20 8:...	6/1/20 5:00 PM
8	Submit monthly requests for payment	3 days?	6/2/20 8:0...	6/4/20 5:00 PM
9	**long lead items Procurement**	7 days	6/5/20 8:0...	6/15/20 5:00 PM
10	Order long lead items – Roofing	7 days	6/5/20 8:0...	6/15/20 5:00 PM
11	Order long lead items – Seating	3 days	6/16/20 8:...	6/18/20 5:00 PM
12	Order long lead items – Plumbing	7 days?	6/18/20 8:...	6/26/20 5:00 PM
13	Order long lead items – Electric	7 days	6/27/20 8:...	7/7/20 5:00 PM
14	**Teporary facilities and services**	24 days?	7/9/20 8:0...	8/11/20 5:00 PM
15	Order long lead items – Electric	24 days?	7/9/20 8:0...	8/11/20 5:00 PM
16	Install Temporary Services	4 days?	8/12/20 8:...	8/17/20 5:00 PM
17	Set up site office	2 days?	8/18/20 8:...	8/19/20 5:00 PM
18	Setup Temporary Shelters	2 days?	8/20/20 8:...	8/21/20 5:00 PM
19	Prepare Site – lay down yard and temporary	2 days?	8/24/20 8:...	8/25/20 5:00 PM
20	Clear and grub site	5 days?	8/26/20 8:...	9/1/20 5:00 PM
21	Stone site access and temporary parking are	1 day?	9/2/20 8:0...	9/2/20 5:00 PM
22	Rough grade site (cut and fill)	5 days?	9/3/20 8:0...	9/9/20 5:00 PM
23	Install storm drainage	10 days?	9/10/20 8:...	9/23/20 5:00 PM
24	Erect building batter boards and layout build	3 days?	9/24/20 8:...	9/28/20 5:00 PM
25	**Foundation and ground floor**	27 days?	9/29/20 8:...	11/4/20 5:00 PM
26	Exacation foundation trenches	27 days?	9/29/20 8:...	11/4/20 5:00 PM
27	Install waterproofing, drains and services	4 days?	11/5/20 8:...	11/10/20 5:00 PM
28	Pour colums and foundation	5 days?	11/11/20 8...	11/17/20 5:00 PM

29		cure foundation	7 days?	10/13/20 8...	10/21/20 5:00 PM
30		Strip column and foundation forms	1 day?	10/12/20 8...	10/12/20 5:00 PM
31		**Ground floor walls and Openings**	**65 days?**	**10/13/20 8...**	**1/11/21 5:00 PM**
32		Erect rebars for block work	65 days?	10/13/20 8...	1/11/21 5:00 PM
33		Lay Blocks with opening for walls	37 days?	1/12/21 8:...	3/3/21 5:00 PM
34		Fabricate and erect rebars for columns and	10 days?	10/21/20 8...	11/3/20 5:00 PM
35		Form and pour columns & beams	9 days?	11/4/20 8:...	11/16/20 5:00 PM
36		Cure Columns & Beams	7 days?	11/17/20 8...	11/25/20 5:00 PM
37		Strip forms from Column & Beams	4 days?	11/17/20 8...	11/20/20 5:00 PM
38		**Form and Pour concrete for 1st floor**	**19 days?**	**11/23/20 8...**	**12/17/20 5:00 PM**
39		Form 1st floor	19 days?	11/23/20 8...	12/17/20 5:00 PM
40		Install electrical underground	4 days?	12/18/20 8...	12/23/20 5:00 PM
41		Install plumbing underground	6 days	12/28/20 8...	1/4/21 5:00 PM
42		Install rebar and in-floor utilities	5 days	1/5/21 8:0...	1/11/21 5:00 PM
43		Pour 1st floor slab	4 days?	1/12/21 8:...	1/15/21 5:00 PM
44	✔	Cure 1st floor slab	1 day?	1/18/21 8:...	1/18/21 5:00 PM
45		Strip forms from 1st floor slab	1 day?	4/21/21 8:...	4/21/21 5:00 PM
46		**First floor wall and openings**	**65 days?**	**1/20/21 8:...**	**4/20/21 5:00 PM**
47		Erect rebars & lay block with openings	65 days?	1/20/21 8:...	4/20/21 5:00 PM
48		Form and pour Columns & Beams	10 days?	4/21/20 8:...	5/4/20 5:00 PM
49		Cure and strip Columns & Beams	10 days	5/4/21 8:0...	5/17/21 5:00 PM
50		**Masonry Work**	**120 days?**	**5/18/21 8:...**	**11/1/21 5:00 PM**
51		Install exterior masonry stone work	120 days?	5/18/21 8:...	11/1/21 5:00 PM
52		Construct manholes, septic tanks and waste	12 days?	5/19/20 8:...	6/3/20 5:00 PM
53		Rough-in Plumbing in Toilet and Kitchen	6 days?	11/2/21 8:...	11/9/21 5:00 PM
54		Lay and clean tiles in bathrooms and kitcher	30 days?	11/10/21 8...	12/21/21 5:00 PM
55		**Roofing**	**15 days?**	**5/29/20 8:...**	**6/18/20 5:00 PM**

56		Install roofing structure, finishing and flashi	15 days?	5/29/20 8:...	6/18/20 5:00 PM
57		Install roof drains and guttering	10 days?	6/9/20 8:0...	6/22/20 5:00 PM
58		**Windown and Doors**	**9 days?**	**6/18/21 8:...**	**6/30/21 5:00 PM**
59		Install windows and Hardware	9 days?	6/18/21 8:...	6/30/21 5:00 PM
60		Install interior doors and hardware	1 day?	6/19/21 8:...	6/21/21 5:00 PM
61		**Building Finishes**	**25 days**	**6/21/21 8:...**	**7/23/21 5:00 PM**
62		Plastering of walls	25 days	6/21/21 8:...	7/23/21 5:00 PM
63		Paint walls and woodwork	5 days?	6/22/21 8:...	6/28/21 5:00 PM
64		Install conduit at ceiling space	6 days?	6/23/21 8:...	6/30/21 5:00 PM
65		Install ceiling grid	5 days	6/23/21 8:...	6/29/21 5:00 PM
66		Install cabinets in kitchen and bathrooms	3 days	6/24/21 8:...	6/28/21 5:00 PM
67		Intall hardware and accessories	2 days	6/24/21 8:...	6/25/21 5:00 PM
68		Complete interior and exterior plantings	3 days	6/25/21 8:...	6/29/21 5:00 PM
69		Pave, curb and stripe parking lot	1 day?	6/28/21 8:...	6/28/21 5:00 PM
70		**Plumbing**	**20 days?**	**6/28/21 8:...**	**7/23/21 5:00 PM**
71		Rough-in plumbing in block walls	20 days?	6/28/21 8:...	7/23/21 5:00 PM
72		Sitting of external Waste pipes	1 day?	6/29/21 8:...	6/29/21 5:00 PM
73		Set plumbing fixtures and trim	5 days?	6/29/21 8:...	7/5/21 5:00 PM
74		Flush, test and clean piping fixtures	2 days?	6/30/21 8:...	7/1/21 5:00 PM
75		**Electrical**	**45 days?**	**6/1/21 8:0...**	**8/2/21 5:00 PM**
76		Rough-in electrical in masonry walls	45 days?	6/1/21 8:0...	8/2/21 5:00 PM
77		Pull wire in conduit and set area transformer	20 days?	6/10/20 8:...	7/7/20 5:00 PM
78		Install and terminate electrical devices	4 days?	6/19/20 8:...	6/24/20 5:00 PM
79		Install light fixtures- test and clean	1 day?	6/19/21 8:...	6/21/21 5:00 PM
80		**Final Clean-up**	**20 days**	**7/8/21 8:0...**	**8/4/21 5:00 PM**
81		Install non-slip ceramic tile flooring in mair	20 days	7/8/21 8:0...	8/4/21 5:00 PM
82		Clean tile floors	3 days?	7/9/21 8:0...	7/13/21 5:00 PM

83		Remove debris from building and do final cl	2 days	7/12/21 8:...	7/13/21 5:00 PM
84		Substantial completion date	1 day?	7/14/21 8:...	7/14/21 5:00 PM
85		**Complete Final Inspection**	15 days?	**8/3/21 8:0...**	**8/23/21 5:00 PM**
86		Complete punch list items from all inspecti	15 days?	8/3/21 8:0...	8/23/21 5:00 PM
87		Obtain certificate of occupancy	3 days?	8/4/21 8:0...	8/6/21 5:00 PM
88		Issue final completion documents including v	2 days?	8/5/21 8:0...	8/6/21 5:00 PM
89		Issue final request for payment	1 day?	8/7/21 8:0...	8/9/21 5:00 PM

Figure 20: Project Schedule (DCF)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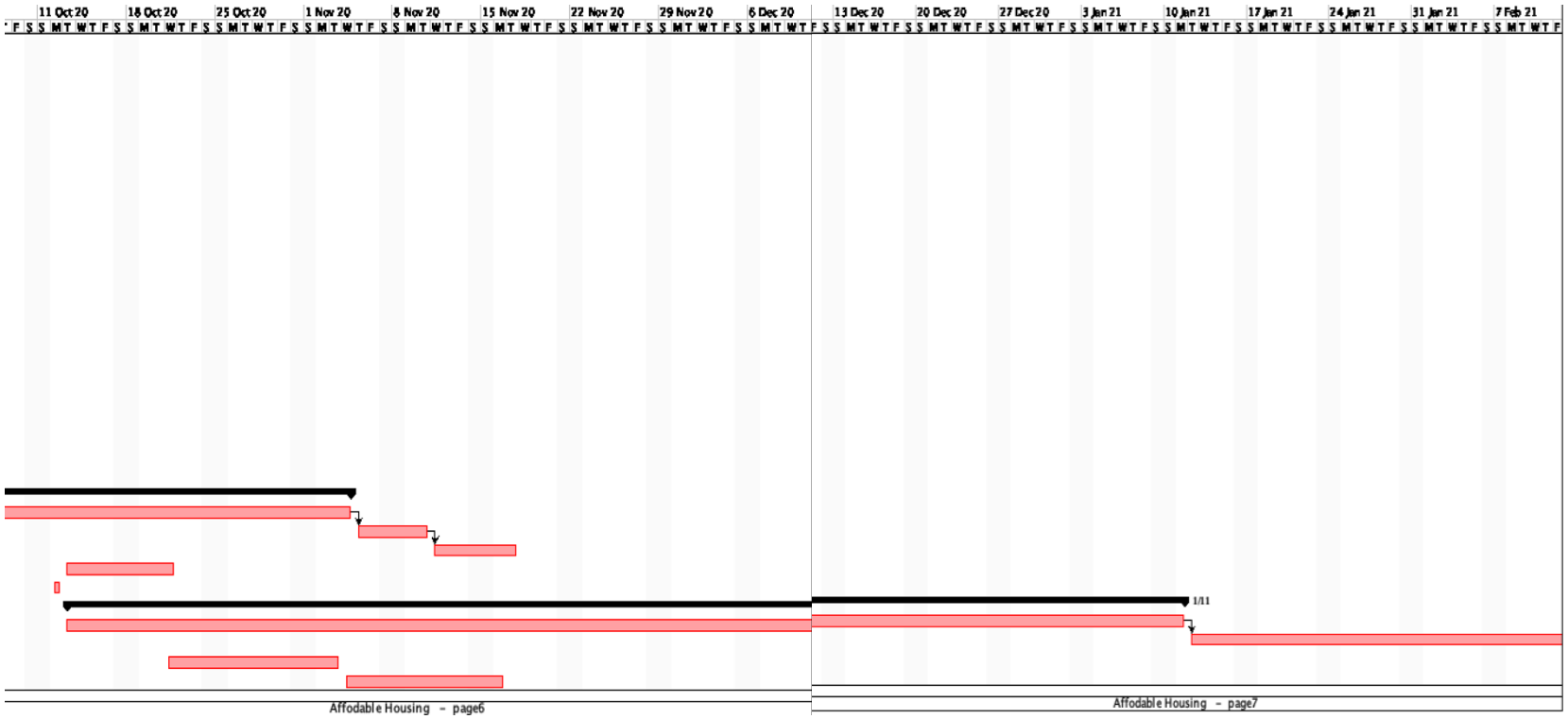

Figure 21: Gantt Chart DCF Affordable Housing Project

4.4. Risk Management Plan

4.4.1. Identifying Risks

First, the risks will be identified during the preparation of the project letter. When creating plans, a complete risk register will be created. Subsequently, the risk register is to be checked during risk identification in order to include or exclude any risk that may or may not apply to the project. The risk register is created and managed by the assistant project manager under the responsibility of the project manager. The risk categories relevant to this project are finance, planning, and stakeholders.

4.4.2. Risk Breakdown Structure

The Risk Breakdown structure (RBS) for the Affordable Housing Project (AHP) is to be categorized into 5 categories:

1. Technical risks: These include uncertainty of resources and availability of materials and equipment, land acquisition/expropriations, inadequate site investigation, or incomplete designing. These risks can commonly occur when there are changes in project scope and requirements, and if there are design errors or omissions.

2. Management related risks: The most common management related risk is uncertain productivity of resources. For the case of the project these include existing legal contract issues and labor resourcing with adequately defined roles and responsibilities.

3. Environmental risks: Belize is vulnerable to adverse weather conditions/natural hazards like tropical storms, hurricanes, flooding, and rising sea levels, all of which have adversely affected the state of the area which the complex is to be erected.

4. Financial risks: Funding, resettlements cost, and cost overruns are a few of the possible financial risks the project might incur during a construction.

5. Reputation: These includes after-project maintenance.

RBS Level 0	RBS Level 1	RBS Level 2
Affordable Housing Project	1. Technical Risk	1.1. Land Acquisition/Expropriations
		1.2. Material and equipment resourcing
	2. Management Risk	2.1. Existing road traffic
		2.2. Legal contract issues
		2.3. Labor resourcing
	3. Environmental Risk	3.1. imapact on local community
		3.2. Adverse weather conditions/natural hazards
		3.3. Wast management and disposal
	4. Financial Risk	4.1. Funding
		4.2. Resettlements cost
		4.3. Cost overruns
	5. Reputation	5.1. After-project road maintenance.

Table 7: DCF Affordable Housing Project - Risk Breakdown structure (RBS)

4.4.3 Probability and impact scales

We have divided both the probability and impact into five (5) scales. These are further explained in the table below.

Scale	Probability
1	The risk event is expected to happen after 121 days period
2	The risk event is expected to happen between 91-120 days period
3	The risk event is expected to happen between 61-90 days period
4	The risk event is expected to happen between 31-60 days period
5	The risk event is expected to happen within 30 days period
Scale	Impact
1	Impact on project cost <300K
2	Impact on project cost from $305K to $355K
3	Impact on project cost from $400K to $ 500K
4	Impact on project cost from $550K to $ 600K
5	Impact on project cost >$625K

Table 8: Affordable Housing Project - Probability and impact scales

4.4.4. Probability and impact matrix

A matrix was developed to show the relationship between the probability and impact and followed these ranges:

1 – 6: Level of risk does not affect project objectives in time and cost
7 – 14: Levels of risk affect project objectives on time and cost. Scope, time and cost must be reviewed.
15 –25: Level of risk compromises company profit and reputation. Project must be cancelled

	Probability				
Impact	5	10	15	20	25
	4	8	12	16	20
	3	6	9	12	15
	2	4	6	8	10
	1	2	3	4	5

Table 9: Affordable Housing Project - Probability and Impact Matrix

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Strategy	Cost
4.1	High cost of a project of this size or magnitude.	Delay in securing funding	Overall delay in the start of the project by 1 month.	5	5	25	Inadequate project proposals submitted to potential donor agencies.	Escalate: to Belmopan City Council because the negotiation of legal documentation between the DCF and donors exceeds the Project Manager authority. Also, the Project Manager has no authority over other areas from the project sponsor.	$500
3.1	The city council has declared that the allocated land plot must be checked for artefacts in order to ensure proper perseveration.	The site could be declared a heritage site.	Overall Project delay of two months.	4	4	16	Discovery of ancient artifacts.	Escalate: to NICH and City Council because those relationships exceed the Project Manager authority.	$1000

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Strategy	Cost
1.2.	DCF subcontract procurement readiness	Slower than anticipated project implementation.	Overall project delay of around 15 days	4	4	16	Non-compliance of Project Execution Unit (PEU) with original project schedule	Mitigate: Review Project contracts, Project Management Plan, Scope baseline, Schedule baseline and Cost baseline in order to guarantee that all stakeholders are aware of project/risks deadlines and milestones.	$1,000
4.3.	Housing project designs are not finalized yet.	Cost overruns due to the lack of final designs and the uncertainty of the Belizean construction market	Budget overrun on around $6K	3	5	15	Construction costs higher than preliminary approved budget	Transfer: Finalizing the designs are the responsibility of Private Company and not of the Project Execution Unit (PEU)/DCF. The Private Company should submit insurance/collateral for potential damage on budget overrun. PEU will keep Project budget monitoring under Financial Officer	$5,000

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Strategy	Cost
								responsibility.	
3.3	DCF Housing project is in a geographical area exposed to natural hazards	Delay due flooding proximity	Flooding of highway construction area for damages worth of around $3M	3	4	12	Flooding from drains near worksite	Escalate: Belmopan City council because these relationships exceed the Project Manager authority. The operation and maintenance plan of drainage must be reviewed by local authorities.	$3,000
4.2.	Private property Resettlement Plan	Delay on purchasing annexed land parcel	Budget overrun on around $50K due to Court resettlement price decision	3	3	9	Court resettlement price decision	Mitigate: Resettlement Plan must guarantee that private property owners accept Project price proposal before the Court decide about potential higher prices.	$15,000
1.1	Lack of early engagement to procure and have proper documen	Delay in acquiring land from private landowners.	Overall project delay of around 90 days.	3	3	6	The legal process of verifying proper title or ownership of lands took longer than expected.	Mitigate: The Resettlement Plan includes deadlines on acquiring land for road expansion and clearance of the Right of Way. Project Manager	$2,500

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Strategy	Cost
	tation in hand.							must guarantee that all stakeholders are aware of project deadlines and milestones.	
2.3	The online applications were not properly filtered.	Unable to get a skilled labor force.	Overall project delay of 45 days.	1	3	3	Absence of site managers.	Mitigate: To ensure that online applications are properly screened, and suitable skilled applicants are contact and interviewed for the different positions.	$2,500
4.2	Equipment operation could damage private property along the way	Private property damage costs	Additional fees and costs for damage compensation	3	1	3	A compensation demand letter is received	Mitigate: The Resettlement Plan includes activities for expansion and clearance of the Right of Way. Plan must be reviewed in order to add clear procedures for processing claims for property damage while navigating to clear land.	$15,000

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Strategy	Cost
2.1	DCF did not sign the temporary Road Closure Act.	Unable to implement road closure to commence the start work.	Overall Project delay of around 2 weeks.	1	2	2	The temporary Road Closure Act was not signed.	Accept: Active acceptance will consider the risk impact on Contingency reserve.	$250
2.2	The Financial Officer did not pay the required fees to the Permit Office.	Unable to get the required construction permits and licenses on time.	Overall Project delay of 30 days.	1	2	2	The permits and licenses were not received.	Accept: Active acceptance will consider the risk impact on Contingency reserve.	$500
5.1.	Historically inadequate maintenance has negatively affected the investment and purpose	Inadequate maintenance upon project completion	Construction company reputation could be compromised	1	2	2	Deterioration within a year period after project completion	Escalate: To project sponsor because the Project Manager has no authority over other areas inside what the sponsor ideally wants for the project.	$10,000

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Strategy	Cost
	of the project.								
									Total: BZD $46,250

Figure 22: DCF Affordable Housing Project - Risk Register (Source: Compiled by Author)

4.5. Cost Management Plan

Cost management has the responsibility of estimating, allocating, and controlling the costs in a project. Planned cost is calculated during the planning phase of a project and is approved before the scheduled tasks commence. When the project is concluded, planned costs vs. actual costs are compared to determine if the project was within budget and to provide a benchmark for future cost management plans and project budgets. Such a process includes activities such as planning cost, estimating, determining a budget, and controlling costs to ensure that the project can be completed within the approved budget.

- Plan cost management – the process that establishes the policies, procedures and documentation for managing and controlling project costs (PMBOK guide 6th Edition, 2016).
- Estimate costs – process used to determine the amount of monetary resources needed to complete project activities.
- Determine budget - the budget provides an overview of the total costs of the project. The cost estimates defined here is based on the cost of each work package or activity. The budget allocates the costs for the project over the time period when the cost will be incurred which assist in the creation of a cost baseline; an approved time-phased budget used to measure actual performance progress against planned.
- Control costs - cost control is concerned with monitoring variances from the cost baseline and taking effective corrective action to achieve minimum risks.

4.5.1 Cost Management Approach

The cost of this project will be managed in the second level of the work breakdown structure (WBS). Control accounts (CA) will be created at this level to track costs. The earned value calculations for CAs will measure and manage the financial performance of the project. The work credit will be allocated at the work package level. The percentage (%) of credit granted to each work package will be calculated based on the amount of work completed at a given

time in relation to the total costs required to complete the work package. Costs can be rounded to the nearest dollar and hours worked at the nearest whole hour.

Cost variations of +/- 0.1 in the cost performance indices and schedule will change the cost status to caution; as such, these values will be changed to yellow in the project progress reports. The +/- 0.2 cost differences in performance indices and cost scheduling will move the cost status to an alert stage; As such, these values will be highlighted in red in the project progress reports. This will require corrective action by the project manager so that the cost performance indices and / or schedules are below the alert level. Corrective actions will require an order to modify the project and must be approved by the project sponsor before they can be included in the scope of the project.

4.5.2. Measuring Project Costs

Performance of the project will be measured using Earned Value Management. The following four Earned Value metrics will be used to measure the project's cost performance:

- Schedule Variance (SV)
- Cost Variance (CV)
- Schedule Performance Index (SPI)
- Cost Performance Index (CPI)

Should the Schedule Performance Index (SPI) or Cost Performance Index (CPI) have a variance between 0.1 and 0.2, the Project Manager must report the reason for the exception. If the SPI or CPI has a variance of greater than 0.2, the Project Manager must report the reason for the exception and provide management a detailed corrective plan to bring the project's performance back to acceptable levels.

4.5.3. Process description and importance

Cost control procedures are put to ensure that this project costs no more than intended. In this project the construction of the housing complex is the main goal, here then the construction cost control procedures help avoid construction project cost overruns and

scheduling lapses by ensuring the progress of the overall goal matches time estimates and forecasts of material, labor and overhead expenditures.

4.5.4. Detailed description of how the project budget is to be controlled

Once final plans are submitted, the project manager and accountant will review the plans and make detailed estimates for labor, materials and construction overhead. Time estimates also will be made in some detail, because cost is a function of time. Projects that fall behind schedule invariably go over budget. If it seems to the project manager and the accountant that the plans are good, then they have a good starting point in order to control the budget; if they any reason to doubt the project budget they should raise it immediately in order to have an adjusted project budget.

For the accountant it becomes important to keep track of completion schedules through a series of intermediate milestones. It is not enough to wait until a project segment is completed; otherwise the project manager and accountant have no oversight of their budget by activity. In order to prevent over budgeting, these two persons need to work closely together.

4.5.5. Cost change management process description

A structured Change Management process is in place which provides for clear documentation of baseline changes with a clearly defined approval process.

This template for change request is mandatory, even for the smallest change. The cost change management will only be a success if all parties are using this; because this will not only illustrate many important components regarding the increase for financial costs but will also show approvals and resources requested and determine if it will affect project goal.

Affordable Housing

$625,000

Project Info

Project Lead:	**Belmopan City Council**
Start Date:	**5/6/2020**

[42]

Budget Summary

Budget	Actual	Under(Over)
$ 625,000	**$ 625,000**	**$ -**

	Labor		Materials		Fixed Costs					
Tasks	Hrs	Rate	Units	$/Unit	Material	Travel	Other	**Budget**	**Actual**	**Under(Over)**
Preliminary								**$ -**	**$ 4,000**	**$ (4,000)**
1.1 Receive notice to proceed and sign contract									-	-
1.2 Submit bond and insurance documents									-	-
1.3 Prepare and submit project schedule									-	-
1.4 Obtain building Permits							4,000.00		4,000.00	(4,000.00)
1.5 Submit monthly requests for payment									-	-
Long Lead Procurement								**$ -**	**$ 38,750**	**$ (38,750)**
2.1 Order long lead items – Roofing			100	$55.00					5,500.00	(5,500.00)
2.2 Order long lead items – Seating			150	$75.00					11,250.00	(11,250.00)
2.3 Order long lead items – Plumbing			300	$15.00					4,500.00	(4,500.00)

2.4 Order long lead items – Electric			500	$35.00					17,500.00	(17,500.00)
Temporary Facilities & Services								**$ -**	**$ 15,740**	**$ (15,740)**
3.1 Install Temporary Services							2,000.00		2,000.00	(2,000.00)
3.2 Set up site office							3,000.00		3,000.00	(3,000.00)
3.3 Setup Temporary Shelters							2,500.00		2,500.00	(2,500.00)
3.4 Prepare Site – lay down yard and temporary fencing	48	$6.75					1,500.00		1,824.00	(1,824.00)
3.5 Clear and grub site	48	$6.75					500.00		824.00	(824.00)
3.6 Stone site access and temporary parking area	48	$6.75					1,500.00		1,824.00	(1,824.00)
3.7 Rough grade site (cut and fill)	96	$6.75					500.00		1,148.00	(1,148.00)
3.8 Install storm drainage	144	$6.75					1,000.00		1,972.00	(1,972.00)
3.9 Erect building batter boards and layout building	96	$6.75							648.00	(648.00)
Foundation and ground floor								**$ -**	**$ 45,748**	**$ (45,748)**
4.1 Excavate foundations Trenches	288	$6.75	200	$35.00			2,000.00		10,944.00	(10,944.00)
4.2 Install waterproofing, Drains, Reinforcement and Services	288	$6.75	400	$30.00	1,000.00		2,000.00		16,944.00	(16,944.00)
4.3 Pour column and foundations	288	$6.75	100	$95.00	1,500.00		1,000.00		13,944.00	(13,944.00)
4.4 Cure foundations	144	$6.75					1,000.00		1,972.00	(1,972.00)
4.5 Strip column and foundation	288	$6.75								(1,944.00)

forms									1,944.00	
Ground Floor Walls and Openings								**$ -**	**$ 108,678**	**$ (108,678)**
5.1 Erect rebars for block work	288	$6.75							1,944.00	(1,944.00)
5.2 Lay Blocks with opening for walls	576	$6.75	800	$75.00	5,000.00				68,888.00	(68,888.00)
5.3 Fabricate and erect rebars for columns and beam	216	$6.75	200	$50.00	2,500.00				13,958.00	(13,958.00)
5.4 Form and pour columns & beams	144	$6.75	200	$50.00	5,000.00		5,000.00		20,972.00	(20,972.00)
5.5 Cure Columns & Beams	144	$6.75							972.00	(972.00)
5.6 Strip forms from Column & Beams	288	$6.75							1,944.00	(1,944.00)
Form and Pour Concrete for 1st floor								**$ -**	**$ 188,034**	**$ (188,034)**
6.1 Form 1st floor	576	$6.75	500	$75.00			5,000.00		56,388.00	(56,388.00)
6.2 Install electrical underground	450	$6.75	1200	$25.00	7,500.00		4,000.00		44,537.50	(44,537.50)
6.3 Install plumbing underground	288	$6.75	1000	$18.00	7,500.00				27,444.00	(27,444.00)
6.4 Install rebar and in-floor utilities	576	$6.75	200	$50.00	9,000.00				22,888.00	(22,888.00)
6.5 Pour 1st floor slab	576	$6.75	200	$75.00	5,000.00				23,888.00	(23,888.00)
6.6 Cure 1st floor slab	288	$6.75					4,000.00		5,944.00	(5,944.00)
6.7 Strip forms from 1st floor slab	288	$6.75					5,000.00		6,944.00	(6,944.00)
First Floor Walls and Openings								**$ -**	**$ 39,269**	**$ (39,269)**

7.1 Erect rebars & lay block with openings	450	$6.75	500	$35.00					20,537.50	(20,537.50)
7.2 Form and pour Columns & Beams	450	$6.75	350	$25.00					11,787.50	(11,787.50)
7.3 Cure and strip Columns & Beams	288	$6.75					5,000.00		6,944.00	(6,944.00)
Masonry work								**$ -**	**$ 60,345**	**$ (60,345)**
8.1 Install exterior masonry stonework	576	$6.75	500	$55.00	5,000.00		2,000.00		38,388.00	(38,388.00)
8.2 Construct manholes, septic tanks and waste chambers	288	$6.75	4				2,000.00		5,944.00	(5,944.00)
8.3 Rough-in Plumbing in Toilet and Kitchen	288	$6.75	200	$35.00			3,000.00		11,944.00	(11,944.00)
8.4 Lay and clean tiles in bathrooms and kitchen	288	$6.75	1500	$0.75			1,000.00		4,069.00	(4,069.00)
Roofing								**$ -**	**$ 14,582**	**$ (14,582)**
9.1 Install roofing structure, finishing and flashing at parapet walls	576	$6.75	150	$25.00	2,500.00				10,138.00	(10,138.00)
9.2 Install roof drains and guttering	288	$6.75	50	$20.00	1,500.00				4,444.00	(4,444.00)
Windows and Doors								**$ -**	**$ 6,694**	**$ (6,694)**
10.1 Install windows and Hardware	144	$6.75			3,000.00				3,972.00	(3,972.00)
10.2 Install interior doors and hardware	144	$6.75			1,750.00				2,722.00	(2,722.00)
Building finishes								**$ -**	**$ 43,996**	**$ (43,996)**
11.1 Plastering of walls	288	$6.75			1,000.00				2,944.00	(2,944.00)

11.2 Paint walls and woodwork	288	$6.75			1,500.00				3,444.00	(3,444.00)
11.3 Install conduit at ceiling space	288	$6.75			2,000.00				3,944.00	(3,944.00)
11.4 Install ceiling grid	288	$6.75			2,000.00				3,944.00	(3,944.00)
11.5 Install ceiling tile	288	$6.75			2,000.00		1,500.00		5,444.00	(5,444.00)
11.6 Install cabinets in kitchen and bathrooms	288	$6.75			4,000.00				5,944.00	(5,944.00)
11.7 Intall hardware and accessories	288	$6.75			3,500.00				5,444.00	(5,444.00)
11.8 Complete interior and exterior plantings	288	$6.75			5,000.00				6,944.00	(6,944.00)
11.9 Pave, curb and stripe parking lot	288	$6.75			4,000.00				5,944.00	(5,944.00)
Plumbing								**$ -**	**$ 6,592**	**$ (6,592)**
12.1 Rough-in plumbing in block walls	288	$6.75							1,944.00	(1,944.00)
12.2 Sitting of external Waste pipes	144	$6.75	50	$25.00					2,222.00	(2,222.00)
12.3 Set plumbing fixtures and trim	144	$6.75	50	$18.00					1,872.00	(1,872.00)
12.4 Flush, test and clean piping fixtures	8	$6.75	20	$25.00					554.00	(554.00)
Electrical								**$ -**	**$ 4,658**	**$ (4,658)**
13.1 Rough-in electrical in masonry walls	48	$6.75					1,000.00		1,324.00	(1,324.00)
13.2 Pull wire in conduit and set area transformers	48	$6.75							324.00	(324.00)
13.3 Install and terminate electrical	96	$6.75	15	$2.50						(685.50)

devices									685.50	
13.4 Install light fixtures- test and clean	48	$6.75	20	$75.00			500.00		2,324.00	(2,324.00)
Final Clean-up and Occupancy								**$ -**	**$ 16,620**	**$ (16,620)**
14.1 Install non-slip ceramic tile flooring in main areas	144	$6.75	150	$85.00			500.00		14,222.00	(14,222.00)
14.2 Clean tile floors	48	$6.75					750.00		1,074.00	(1,074.00)
14.3 Remove debris from building and do final clean-up	48	$6.75					1,000.00		1,324.00	(1,324.00)
14.4 Substantial completion date									-	-
Complete Final Inspections								**$ -**	**$ 31,295**	**$ (31,295)**
15.1 Complete punch list items from all inspections							5,000.00		5,000.00	(5,000.00)
15.2 Obtain certificate of occupancy							5,000.00		5,000.00	(5,000.00)
15.3 Issue final completion documents including warranties									-	-
15.4 Issue final request for payment									21,295.00	(21,295.00)

Figure 23: Affordable Housing Project Budget (Source: K, Shaw 2020)

4.5.6. Contingency Plan

Project Budget Item	Project Costs
Construction & Administration	$ 625,000.00
Plans	$ 8,000.00
Permits	$ 4,000.00
Contingency (3%)	12,000.00
Management Reserve	$ 18,750.00
GRAND TOTAL	**$ 667,750.00**

Table 10: Affordable Housing contingency plan (Source: K, Shaw 2020)

4.6. Quality Management Plan

The PMBOK Guide states that, "project quality management includes the processes and activities of the performing organization that determine quality policies" (PMBOK Guide 6th Edition, 2016).

The process includes:

- Plan quality management - Quality management planning is the process of relating quality requirements or standards for the project to its deliverables and documenting how the project will comply with the quality requirements or standards outlined. (PMBOK Guide 6th Edition, 2016.
- Perform quality assurance - The PMBOK Guide 6th Edition describes quality assurance as the process of auditing the quality requirements and the results from quality control measurements to ensure that appropriate quality standards and operational definitions are used (PMBOK Guide 6th Edition, 2016).
- Control quality – involves the monitoring and controlling quality activities to assess performance and recommend changes (PMBOK Guide 6th Edition, 2016).

The Quality Management Plan is an essential part of this project as it describes how quality will be managed throughout the lifecycle of the project. Quality management is an important aspect of a project management plan as the processes involved ensures that the objectives and goals of the plan are achieved in a manner that satisfies the requirements needed to satisfy DCF.

4.6.1. Quality Development and Requirements

Quality Checklist					
Project:					**Date:**
	Verification				
Quality Item	**Yes**	**No**	**N/A**	**Date**	**Comments**
Does the project have an approved quality management plan?					
Has the quality management plan been reviewed by all stakeholders?					
Do all stakeholders have access to the quality management plan?					
Is the quality management plan consistent with the rest of the overall project plan?					
Have product quality metrics been established, reviewed, and agreed upon?					
Have process quality metrics been established, reviewed, and agreed upon?					
Do all metrics support a quality standard which is acceptable to the customer?					
Do all metrics have agreed upon collection mechanisms?					

Do all metrics have an agreed upon collection frequency?					
Have quality metrics review meetings been scheduled throughout the project's duration?					
Are all metrics clear, measurable, controllable, and reportable?					
Is the project team familiar with the project's quality review process?					
Does the project have an appropriate number of resources assigned for quality assurance and control?					
Has the project team established a repository for all quality documentation?					
Do all team members have access to the quality documentation repository?					
Have all appropriate team members been notified of their required participation in quality reviews?					
Have quality responsibilities been assigned and documented and the applicable personnel notified?					
Have product and process quality standards been established, documented, and communicated?					

Have quality thresholds and limits been established, documented, and communicated?					
Does the change control process accommodate project changes based on quality improvements?					
Has a project quality manager been assigned?					
Is the project sponsor aware of his/her responsibilities relating to quality acceptance?					
Is the customer aware of his/her responsibilities relating to quality acceptance?					

Table 11: Quality Management Plan. Adapted from Project Management Docs. Retrieved December 22, 2019 from http://www.projectmanagementdocs.com/template/Human-Resource-Plan.doc

4.6.2. Quality Assurance and control

The aim of the project management plan is to create a document that will ensure that the proposed project is within the proper guidelines to fully develop the project, therefore in order to ensure quality, an iterative process of document reviews will be used throughout the life cycle of the plan.

The Project Manager will schedule regular document review meetings in which the project team will review the project processes and discuss process improvement initiatives. All process improvement efforts will be documented, implemented, and communicated to all stakeholders as they are updated.

4.6.3. Roles and Responsibilities

In order to ensure that the project quality objectives are met the project team members with quality responsibilities are outlined in the Quality Management Plan.

Project Manager

1. Oversight of Quality Management Plan.
2. Outline quality requirements.
3. Ensure that quality audits are performed.
4. Review contractors' performance
5. Schedule meetings for the project team to meet and review the project quality approach.
6. Appoint someone to manage the project quality.

Main Contractor

1. Manage subcontractors
2. Conduct and review quality inspections
3. Develop a process for ensuring quality
4. Ensure that the drawing specifications are followed
5. Ensure that each phase is sufficiently planed for.
6. Assess suppliers' performance.

Site Manager

1. Inspect all supplies
2. Ensure that supplies are properly stored.
3. Ensure that storage facilities are maintained in good working order
4. Monitor inventory to ensure that supplies are of the desired quality
5. Document all reviews and audits performed
6. Provide feedback to the project manager on a regular basis or on demand

4.7. Human Resources Management

Human resource management is an important part of the housing project. The human resources management plan is a tool that will facilitate the management of the project's human resources activities throughout the project until its closure. The human resources management plan includes:

- Roles and responsibilities of team members throughout the project
- Project organization charts
- Staffing management plan to include:

    - How resources will be acquired
    - Timeline for resources/skill sets
    - Training required to develop skills
    - How performance reviews will be conducted
    - Recognition and rewards system

The human resources management plan serves to achieve project success by ensuring the appropriate human resources are acquired with the necessary skills, resources are trained if any gaps in skills are identified, team building strategies are clearly defined, and team activities are effectively managed.

4.7.1. Roles and Responsibility

The roles and responsibilities for the Software Upgrade Project are essential to project success. All team members must clearly understand their roles and responsibilities in order to successfully perform their portion of the project. For the Housing Project, the following project team roles and responsibilities have been established:

Project Manager (PM): responsible for the overall success of DCF housing project. The PM must authorize and approve all project expenditures. The PM is also responsible for approving that work activities meet established acceptability criteria and fall within acceptable variances. The PM will be responsible for reporting project status in accordance with the

communications management plan. The PM will evaluate the performance of all project team members and communicate their performance to functional managers. The PM is also responsible for acquiring human resources for the project through coordination with functional managers. The PM must possess the following skills: leadership/management, budgeting, scheduling, and effective communication.

Design Engineer (DE): responsible for gathering coding requirements for the project.

Foreman (F): responsible for the technical requirements as per the specifications and drawings. The Foreman ensures that each skilled worker carries out the work per the specifications.

Draftsman (D): responsible for all revisions, 2D and 3D drafting, designs and details based on change orders and addendums.

Electrical Subcontractor (ES): responsible for reading and calculating electrical drawings and ensuring their correct placement in the building. In addition, the ES is responsible for installing all building and site lighting as per electrical and site layouts and schedules.

Plumbing Subcontractor (PS): responsible for reading and calculating plumbing drawings and ensuring their correct placement in the building within schedule constraints.

Fire and Safety Subcontractor (FSS): responsible for determining the necessary apparatus required to ensure fire safety.

Field Superintendent (FS): responsible for any and all production and business pertaining to the site works.

Roofing Subcontractor (RS): responsible for reading Architectural drawings pertaining to the roof layout and constructing the roof in accordance with the specifications and schedule constraints.

Tiling Subcontractor (TS): responsible for reading the floor plan drawings and installing tiles as per layouts and in accordance with acceptable industry standards and within schedule constraints.

Faux Installation Subcontractor (FDIS): responsible for installing all faux components within schedule constraints.

Windows and Doors Subcontractor (WDS): responsible for ensuring that the window and door schedules and specifications are adhered to in the manufacturing of the windows and installation of same in accordance with the drawings and within schedule constraints.

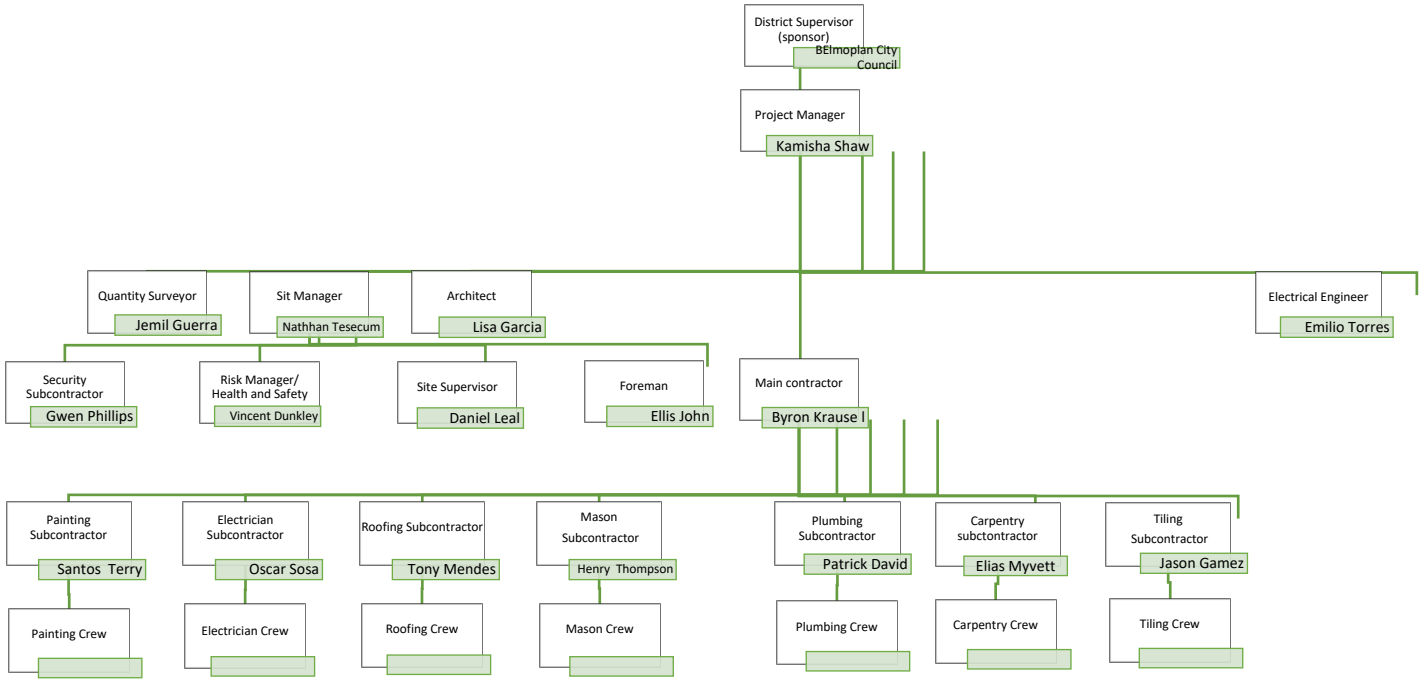

Figure 24: Construction Organizational Chart (Source: K, Shaw 2020)

The following RACI chart shows the relationship between project tasks and team members. Any proposed changes to project responsibilities must be reviewed and approved by the project manager. Changes will be proposed in accordance with the project's change control process. As changes are made all project documents will be updated and redistributed accordingly.

	Project Manager	QA & C Manager	Engineer	Communication Specialist	Procurement Officer	Subcontractors	Functional Manager
Gathering Requirements	A	C	C				I
Building Design	A	C			R		I
Change request	A	C			R		I
Feasibility Study	A	C			R		I
Approvals (permits)	A				R		I
Project Quality	A	C		R			C
Procurement	A	C	R			C	I
Stakeholder Management	A						

Table 12: RACI Chart (Source: Compiled by Author)

Key:
R – Responsible for completing the work
A – Accountable for ensuring task completion/sign off
C – Consulted before any decisions are made
I – Informed of when an action/decision has been made

4.8. Communication Plan

The PMBOK Guide, 6th edition, describes the management of project communication as “the processes required to ensure timely and appropriate planning, creation, distribution, storage, retrieval, management, control, monitoring and the ultimate disposition of project information” (PMBOK guide 6th Edition, 2016).

The communication plan for this project serves as a guide for the exchange of information throughout the project life and is updated as the communication requirements change. The plan identifies and defines the roles of the people involved in this project and the communication matrix defines the communication requirements. The matrix serves as a guideline as to which information should be communicated, who should communicate, when and with whom. The project manager documents the preferred frequency of each interested party, the communication method and the communication channels that are retained in the register of project participants. The project manager must ensure that interested parties have access to these channels to receive project notifications.

4.8.1. Communications Matrix

Communication Type	Objective of Communication	Medium	Frequency	Audience	Deliverable	Format
Kickoff Meeting	Introduce the project team and the project. Review project objectives and management approach.	• Face to Face	Once	• Project Sponsor • Project Team • Stakeholders	• Agenda • Meeting Minutes	• Soft copy archived on project SharePoint site and project web site
Project Team Meetings	Review status of the project with the team.	• Face to Face • Conferenc e Call	Weekly	• Project Team	• Agenda • Meeting Minutes • Project schedule	• Soft copy archived on project SharePoint site and project web site
Technical Design Meetings	Discuss and develop technical design solutions for the project.	• Face to Face	As Needed	• Project Technical Staff	• Agenda • Meeting Minutes	• Soft copy archived on project SharePoint site and project web site
Monthly Project Status Meetings	Report on the status of the project to management.	• Face to Face • Conferenc e Call	Monthly	• PMO	• Slide updates • Project schedule	• Soft copy archived on project SharePoint site and project web site

Project Status Reports	Report the status of the project including activities, progress, costs and issues.	• Email	Monthly	• Project Sponsor • Project Team • Stakeholders • PMO	• Project Status Report • Project schedule	• Soft copy archived on project SharePoint site and project web site

Table 10 : Communication Matrix. Adapted from *Project Management Docs.* Retrieved December 22, 2019 from http://www.projectmanagementdocs.com/template/Comunication plan.doc

4.9. Procurement Management Plan

4.9.1. Introduction

This Procurement Management Plan sets the precedence for the procurement framework for DCF Affordable Housing project. It will be serving as a guide for managing the procurements throughout the life of the project. In addition, the plan will be updated as acquisition needs change or arise. This plan identifies and defines the items to be procured, the types of contracts to be used in support of this project, the contract approval process, and decision criteria. The importance of coordinating procurement activities, establishing firm contract deliverables, and metrics in measuring procurement activities is also included.

4.9.2. Procurement Management Approach

The Project Manager will provide oversight and management in concert with appropriate agency procurement and management staff for all procurement activities under DCF Housing Project. The Project Manager will work with the project team to identify all required items to be procured for successful completion of the project. The Project Manager will then review the procurement list with the Project Steering Committee (PSC) for approval. The process will determine if the acquisition of outside support is required and in such a case decide what to acquire, how to acquire it, how much will be acquired, and when to acquire it.

4.9.3. Procurement Definition

The following procurement items and/or services have been determined to be essential for completion and success of the DCF project. The list of items/services, justification, and timeline are as follows:

Item/Service	Justification	Needed By
Steel Superstructure	The skeleton for the building framework	Week 1
Reinforced Steel	Used to reinforce all concrete components	Week 1
Concrete	This is a mixture resulting from sand and aggregate bound by cement that has chemically reacted with water.	Week 1
Plywood	Will be used to produce formwork and in some instances as a substrate	Week 2
Wood	Will be used to produce formwork and to reinforce some aspects of the buildings	Week 2
Screws and Nails	Fasteners	Week 1
In-walls	Will be used as structural studding	Week 3
DensGlass Gold	Substrate for the exterior	Week 4
Insulation	Used to maintain the temperature produced by the chill water air-conditioning system in the building	Month 3
Windows and Doors	Used as a transparent barrier to eliminate water, etc.	Month 7
Interior Wall Systems	Used to separate the various rooms	Month 5
Faux Moldings	Form molding used to mimic known architectural profiles	
Ceilings	Used to separate floor levels	Month 6
Mansard Roof System	Mechanically fastened metal C-channel used to profile the roof system	
Standing Seam Roofing	Metal riveted used to protect the plywood and ice and water shield	Month 4
Gutter System	Metal system used to divert water into down leaders	Month 12
Concrete floor System	Structural component used to uphold the dead weight and live weight of a floor system	Month 7
Roof deck	Structural component used to uphold the dead weight and live weight of a floor system	Month 9
Annex Building (roof deck)	Used to house both restrooms (male and female) and the kitchen holding space	
Chill water air-conditioning system	Designed to provide forced air into the building and to regulate the temperature	Month 10
Electrical Transformers	Used to regulate the current into the building	Month 7
Telephone System and Equipment	Used to provide telephone communications into the building	Month 12
Deck finishes	Aesthetic feature that provides a non-slip resistance to surfaces	Month 9
Umbrella tables	For dining and lounge purposes	Month 11
Chairs	To sit	Month 12

Two elevators	Vertical transport	Month 7
Luxury entrance stairs	Entrance way	Month 8
Two exit stairs	Exit	Month 13

Table 11: Procurement List (Source: Compiled by Author)

In addition to the above list of procurement items, the following individuals are authorized to approve purchases for the project team:

Name	**Role**
Kamisha Shaw	Project Manager
Thomas Krause	Lead Engineer
Byron Mendoza	Design Technician

4.9.4. Contract Type

Items and services to be procured for the project will be petitioned under firm-fixed price contracts. The Request for Proposal (RFP) Coordinator will solicit bids from various vendors in order to procure the items within the required time frame and at a reasonable cost under the firm fixed price contract once the vendor is selected. With this type of contract, the seller agrees to provide their service or product at a set price, independent of resulting equipment, material, and labor costs. This means that the seller will bear any costs beyond the agreed-upon amount. This type of contract has the least risk for the buyer. A well-defined scope and statement of work and a selection of competitive bidders help control pricing for this type of contract. If you don't have a clearly defined scope of work, this may not be the best type of contract. (Tucker, 2019)

Works Contract Sample

(STATE NAME OF ORGANISATION)SERVICES CONTRACT

AGREEMENT TO PROVIDE SERVICES

BETWEEN:

(State name of Organisation), Post Office Box: _____
Telephone No: _____, hereby referred to as **"Employer",**

AND

_____ of Post Office Box _____ and of Telephone No: _____ Fax No: _____ referred to as the **"Contractor".**

1. Services

a)(STATE NAME OF ORGANISATION) has engaged Contractor as an independent contractor to provide the following services: -

- _____
- _____

Detailed Bill of Quantity is hereby attached. Specifications contained in the tender document are still relevant and are a part of this contract.

1.2 Contractor will coordinate in the execution of this contact with (STATE NAME OF ORGANISATION) water engineer, (Named Govt Rep and (STATE NAME OF ORGANISATION) Project engineer.

1.3 Contractor will supply, at Contractor's sole expense, all equipment, materials and/or supplies necessary to perform the services under this Agreement except those that will be provided by (STATE NAME OF ORGANISATION)K.

2. Time Schedule

Contractor will begin providing services immediately upon signing this Agreement and will complete all services in ..... from the date of signing this agreement unless this Agreement has been terminated sooner in accordance with its provisions. Two weeks will be mobilization and the rest of the time allocated will be used for construction of the project. The penalty for delay will be 0.25% of the contract sum per day.

3. Payment for Services and Expenses

3.1 (STATE NAME OF ORGANISATION)K shall pay the Contractor for services detailed in the Bill of Quantity hereby attached. The contract sum is ..... (in Words..... Thousands and Four ..... Only) is the agreed payment for this work.

3.2 All travel expenses incurred by Contractor in the performance of services hereunder, are included in the contract sum.

Figure 25: Procurement contract sample (Source: Legal Contracts Assist)

5. Acceptance

Approved by:

_____ Date: _____

<Approvers Name>
[PROJECT NAME] Executive Sponsor

_____ Date: _____

<Approvers Name>
[PROJECT NAME] Business Sponsor

_____ Date: _____

<Approvers Name>
[PROJECT NAME] Project Director/Manager

_____ Date: _____

<Approvers Name>
[PROJECT NAME] Stakeholder

Figure 26: Procurement Acceptance

4.10. Stakeholder Management Plan

Purpose:

Stakeholder Management includes the processes that are required to identify the people, groups and organizations that could affect or be affected by the project, to analyze stakeholder expectations and their impact on the project, and to develop the appropriate strategies and tactics for effectively engaging stakeholders in a manner appropriate to the stakeholders' interest and involvement in the project. The Stakeholder Management Plan ensure that stakeholders are effectively involved in project decisions and execution (PMBOK 6th Edition) throughout the lifecycle of the project, to gain support for the project and anticipate resistance, conflict, or competing objectives among the project's stakeholders. The Stakeholder Management Plan includes several sections:

- **Identify Stakeholders** – identify by name and title the people, groups, and organizations that have significant influence on project direction and its success or who are significantly impacted by the project.
- **Plan Stakeholder Management** – identify the strategies and mechanisms that will be used to achieve the greatest support of stakeholders and minimize resistance.
- **Manage Stakeholder Engagement** – outlines the processes and steps that will be undertaken to carry out the planned strategies.
- **Control Stakeholder Engagement** – describes the methods that will be used to monitor stakeholder engagement and alert the project team if problems are surfacing.

Construction stakeholders	Role/skill set
Site Joiner	Craft
Wood machinist	
Bricklayers	
General construction	
Laborer	
Painter and Decorator	
Ceiling Fixer	
Roofer	
Scaffolder	

Construction stakeholders	Role/skill set
Plant Mechanic	
Plant Operator	
Plasterer	
Demolition Operative	
Steel erectors/structural	
Electrician	
Client	Customer
Project Manager	Professional/managerial
Architects	
Site Supervisor	
Structural Engineer	
Quantity Surveyor	
Building Surveyor	
Construction Manager	
Site Foreman	
Planner	
Facilities Manager	
Managing Director	
Mayor	
Contracts Manager	
Commercial Manager	
Investors	Funding
Suppliers	Group or department
Regulatory authorities	
Emergency services	
Marketing	
Procurement	
Civil Engineer	Technical
Architectural Technician	
Buyer	
Construction Technician	
Estimator	
Plant Technician	
Roofing Technician	
Environmental regulators	Statutory authorities/regulators
Planning authorities	
Building Control/Building Regulations	
Transport and Infrastructure	
Waterways and coastal authorities	

Table 15: Stakeholder list (Source: Compiled by Author)

ID	Stakeholders	Functional Area	Roles - Responsibilities	Main Expectations
1	Craft	Technical/project team (employees)	To provide quality work that upholds DCF standards and	To work in an environment that is inclusive and cognizant of individual safety.
2	Client	Main Sponsor	To provide a clear scope of what is expected from DCF to carry out.	Timely and continuous reporting of project activities through written and oral communication (e.g. Progress Reports, emails, meetings) Fully functional and operational housing complex that will be eco-friendly and affordable for those looking for somewhere to rent.
3	Professional/Managerial	Project Management team	Provide quality overall project that reflect DCF mission	To fulfill a project that will that is on schedule, budget and adhering to PMI knowledge areas.
4	Funding	Sponsor	Provide sufficient amount of money to cover the cost of the project and other operational cost	Money allocated will be within budget and project satisfaction
5	Group or Department	Procurement and operational	Provide right judgement for the project in regard to purchases and	Projects are
6	Engineers, Technician and	Technical	Provide engineering design and construction plans and ensure project completion is up to standard.	Feasibility study and technical reports along with Risk Management Plan to properly manage risks associated with the project and Daily reports on project activities to monitor progress and adjust plans accordingly

7	Statutory Authorities and Regulators	Operational management	Provide direction for the project to ensure project meets standards in operational management and building codes and requirements	Certification documents to verify that the housing project is in compliance with international standards and proper protocol

ID	Stakeholders	Functional Area	Influence	Impact	Power	Interest
			(Low-Medium-High)			
1	Craft	Technical/project team (employees)	High	High	Medium	High
2	Client	Main Sponsor	High	High	Hight	High
3	Professional/Managerial	Project Management team	Low	Medium	High	High
4	Funding	Sponsor	High	Low	Low	High
5	Group or Department		Medium	Medium	Low	High
6	Engineers, Technician and	Technical	High	Hight	Medium	High
7	Statutory Authorities and Regulators	Operational management	Low	Low	Low	High

Table 16: Stakeholder Matrix (Source Compiled by author)

5. CONCLUSIONS

1. The Project Management Plan was created using the analytical research method and the sixth edition of the PMBOK® Guide, to be used as a developmental tool for Dria Consultancy Firm Project Management team.

2. The Project Charter was the first subsidiary element of the Project Management Plan, created as the deliverable for specific objective using a template as a guide, to capture and organize the business needs and objectives, project description, preliminary scope statement, initial project risks, project deliverables, summary milestones, and project budget, the Project Charter also included identification of the project manager and the sponsor's authorization for the project to commence which are key components to the project.

3. To define and specify the scope of the project, the Scope Management Plan, the deliverable created for specific objective number two, along with the WBS, WBS dictionary, Requirements Management Plan, Requirements Document, were developed from a table or template, capturing the information gathered during meetings with project stakeholders and from project document reviews.

4. The Schedule Management Plan, the output from specific objective number three, was created along with the Activity List, Schedule Network Diagram, Resource Assignments table and Project Gantt chart, in order to adequately identify and coordinate each project activity to ensure the project's completion within the time constraints.

5. To create the Cost Management Plan a template in Microsoft Excel was used to adequately develop the project budget, and a template was used to capture the Cost Management Plan which will guide the development of cost management performance measures and documents.

6. To develop the Quality Management Plan, a template was used to identify the project's quality management approach, quality requirements/standards, quality assurance, quality control, and the quality control measures that will be used throughout the project. It was done in order to ensure that quality was built into the project's processes and product.

7. To address specific objective number six, the Human Resource Management Plan, all human resources required to complete the project were identified and classified in a comprehensive list based on their roles and responsibilities. In addition, the project organization chart, the staffing management approach, and details identifying how the human resources will be managed throughout the project are detailed in the plan.

8. To fulfil specific objective number seven, the Project Communications Plan, a template was used along with a list of all stakeholders and their roles and responsibilities. In addition, a Communications Matrix was developed, detailing all project stakeholders (names/titles, information, format) throughout the project lifecycle, and ensuring that the information disseminated during the project is done at the right time, in the right format, to the right people and by the right person.

9. The Risk Management Plan was created using a template. Additionally, to capture and classify project risks, so that effective risk responses could be planned, a Risk Register was developed along with a qualitative risk analysis. Quantitative Risk Analysis was not performed during this process as the tools were not available for use.

10. The Procurement Management Plan deliverable, created for specific objective nine, was developed using a template to identify the project's procurement management approach, types of contracts used and contract approval process. The plan is comprehensive since it also details procurement risks and constraints, and how these issues, along with vendors, will be managed effectively.

11. The Stakeholder Management Plan, developed for specific objective ten, was also developed using a template. In addition to the plan, which details how stakeholders will be identified, classified, managed and engaged throughout the project, the Stakeholder

Register, Stakeholder Analysis and Level of Engagement were also developed to provide more information for effective stakeholder engagement.

6. RECOMMENDATIONS

- DCF should employ formal Project Management methods and formal construction management to increase the likelihood of project success in the completion of building projects.
- DCF should develop standard project management initiation and planning documents prior to the execution of building projects.
- All projects managed by DCF should be headed by a project management team, using developed standard project planning documents tailored for the project.
- The firm should invest in the tools required to complete quantitative risk analyses for all projects.
- Project Management Guide or Framework to direct the development of all project management tools should be used my DCF.
- Project management team for DCF should exercise care and caution during the development of each subsidiary plan of the Project Management Plan to ensure that all planning subsets for each knowledge area or respective application area are thorough and accurate.
- DCF project management team should utilize a document management and storage system, to organize and store all documents created for future use and review.
- The most senior manager of DCF should ensure that a project management team be hired and installed prior to the execution of any project. They should ensure that this team conduct all project planning related activities in order to enhance the proper management of the project during its lifecycle.
- The project management team of DCF should consider the use of the planning process and templates created during the development of the Project Management Plan for the housing complex, as a basis for implementing a methodology to be used by the company for future projects of similar relevance.

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8. APPENDICES

Appendix 1

PROJECT CHARTER	
Date	**Project Name:**
May 13th, 2019	Project management plan to provide and construct affordable housing for the people in the City of Belmopan.
Knowledge Areas / Processes	**Applicacion Area (Sector / Activity)**
Knowledge areas: • Project integration • Project scope management • Project time management • Project cost management • Project quality management • Project Human Resource Management • Project Communication Management • Project Risk Management • Project Procurement Management • Project Stakeholder Management Process groups: • Initiating process group • Planing process group • Executing process group • Monitoring and Controlling process group • Closing process group	Area of application is in construction.
Start date	**Finish date**
May 13th , 2019	Corresponds to the date when the project is scheduled to be finished
Project Objectives (general and specific)	

General objective:
To create a project management plan for the project to foster affordable housing for the working class using income based rental.

Specific objectives:

1. To create a project charter that officially authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the project management plan.
2. To develop a scope management plan to ensure that all objectives of the project are maintained during the project lifecycle.
3. To develop a schedule management plan that will aid in the development and management of a success project.
4. To create a time management plan which ensures that the project is completed as scheduled.
5. To develop a cost management plan to make sure the project is within budget.
6. To design a quality management plan to make certain that all resources needed to complete the project successfully are available.
7. To develop a human resource plan to ensure that all human resources are identified and effectively managed.
8. To create a communications management plan to ensure that lines of communications and the project performance are properly documented.
9. To develop sustainable procurement management plan for identifying and assigning contracts to suppliers who are able to procure sustainable goods and services.
10. To construct a stakeholder management plan that documents the interaction between stakeholders and processes used to manage issues identified on the project.

Assumptions

It is assumed that all concepts have been grasped during the tenure if the program to carry out th graduation project.
It is assumed that he project may not be modified
It is assumed that ther will be help to guide during the process of the project.
Project is assumed to have the potential to be completed by one person.

Constraints

Time: There is a limited period of time to complete the FGP (three months)

Cost: The potential of an incrrease in cost to fulfill the project
Resources: The risk of not having sufficient resources for suffice the project.

Preliminary risks

If requirements are not properly identified submission can be delayed which will imacpt time, sco
potential quality.
If there are not clear lines of communication there can be confufion about the scope of the projec
If there is not not enough milestones that accurately track the project difficulty can be seen in cos
and time.
Having a schedule that is not properly developed can pose threat to the scope and time of the pr

Budget

$625,000

Milestones and dates

Final graduation project	329 days?	5/13/19 8:00 AM	4/5/20 5:00 PM
Graduation Seminar Start project	35 days?	**5/13/19 8:00 AM**	**6/16/19 5:00 PM**
Project charter	4 days?	5/13/19 8:00 AM	5/16/19 5:00 PM
WBS	2 days?	5/17/19 8:00 AM	5/18/19 5:00 PM
Chapter 1: Introduction	1 day?	5/20/19 8:00 AM	5/20/19 5:00 PM
FGP Schedule	4 days?	5/23/19 8:00 AM	5/26/19 5:00 PM
Theoretical Framework	3 days?	5/27/19 8:00 AM	5/29/19 5:00 PM
Methodological Framework	7 days	6/3/19 8:00 AM	6/9/19 5:00 PM
Executive summary	3 days	6/10/19 8:00 AM	6/12/19 5:00 PM
Annexes, Bibliography	2 days	6/13/19 8:00 AM	6/14/19 5:00 PM
Signed Charter– Approval	1 day?	6/15/19 5:00 PM	6/16/19 5:00 PM
Tutoring	114 day...	**11/11/19 8:00 ...**	**3/3/20 5:00 PM**
Delivery 1 : 4.1– 4.2	35 days?	11/11/19 8:00 ...	12/15/19 5:00 PM
Delivery 2 : 4.3 – 4. 7	13 days?	12/16/19 8:00 ...	12/28/19 5:00 PM
Delivery 3 : 4.8 – 4.10	8 days?	12/29/19 8:00 ...	1/5/20 5:00 PM
Chapter IV Development	17 days?	1/6/20 8:00 AM	1/22/20 5:00 PM
Chapter V Conclusion and all plans	17 days?	1/23/20 8:00 AM	2/8/20 5:00 PM
Recommendation	6 days?	2/9/20 8:00 AM	2/14/20 5:00 PM
FGP Extention Edits	18 days?	2/15/20 8:00 AM	3/3/20 5:00 PM
Reading by Reviewers	9 days?	**3/17/20 8:00 AM**	**3/25/20 5:00 PM**
Review assignement request	5 days?	3/17/20 8:00 AM	3/21/20 5:00 PM
Assignment of two reviewers	2 days?	3/22/20 8:00 AM	3/23/20 5:00 PM
Reviewer	2 days?	3/24/20 8:00 AM	3/25/20 5:00 PM
Adjustments	8 days?	**3/26/20 8:00 AM**	**4/2/20 5:00 PM**
Report for reviewers	3 days?	3/26/20 8:00 AM	3/28/20 5:00 PM
FGP update	3 days?	3/29/20 8:00 AM	3/31/20 5:00 PM
Second review by reviewer	2 days?	4/1/20 8:00 AM	4/2/20 5:00 PM
Presentation to Board of Examiners	4 days?	**4/3/20 8:00 AM**	**4/6/20 5:00 PM**
Final review by board	3 days?	4/3/20 8:00 AM	4/5/20 5:00 PM
FGP grade report	1 day?	4/6/20 8:00 AM	4/6/20 5:00 PM

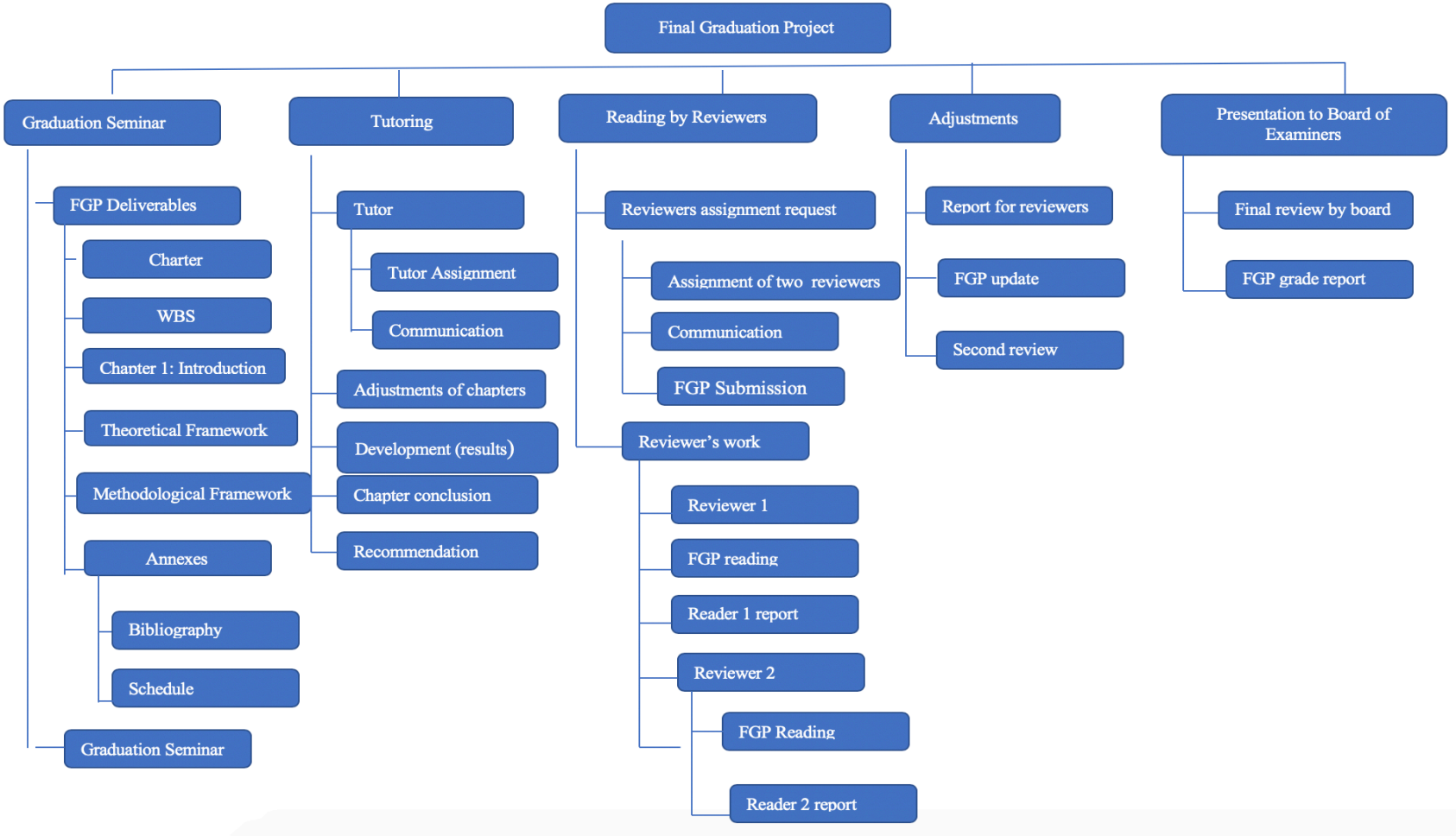
Project purpose or justification (merit and expected results)

With the City of Belmopan being the capital in the country of Belize it is sought out as an established center that holds some certainty of employment. Cost of living in the country is on a constant rise and all classes are feeling the pinch of the current economic climate. Many individuals within the city, in attempts to boost their income are looking into side hustles and various passive income options. One main choice has been rentals. Though this is seen as an

income booster many people view this method as a quick way out. The job market is not the largest but with more and more buildings, houses and apartments for rent, many people are living paycheck to paycheck and majority of the availble rentals are highly priced which in turn makes it difficult to pay. The main purpose of the affordable housing project is to foster a conducive option on a small scale to assist those of the working community. Affordable housing in Belmopan with this project is aimed at making it almost impossible to pick out from the other homes and apartments partially because the houses and apartments look like the rest of the housing in the city. The difference here is that in price per unit. This project will help individuals who are looking for a place to rent that is within budget and flexible. The project management plan is expected to adequately assist the project in navigate smoothly. It will provide all necessary documents required to fullfill all a successful project.
Description of Product or Service to be generated by the Project – Project final deliverables
Project Charter
Scope Management Plan, Requirements Management Plan, Requirements Document and Requirements Traceability Matrix
Schedule Management Plan, Activity List, Schedule Network Diagram, Resource assignments and activity durations, and Schedule in Gantt chart
Risk Management Plan and Risk Register
Cost Management Plan, Cost Baseline and Project Funding Requirements
Quality Management Plan
Human Resource Management Plan
Communication Management Plan and Communications Matrix
Procurement Management Plan

Stakeholder Management Plan, Stakeholder Analysis Chart, and Stakeholder Register	
Relevant historical information	
Housing projects have never been undertaken to a full extent to help the general public. This is th it's kind that focuses on the srtruggling working class.	
Stakeholders	
Direct stakeholders: Global School of Project Managememt (UCI) Tutor and Lecturer Board of examiners Project manager – Kamisha Shaw Indirect stakeholders: Belmopan City Council Family Peers	
Project Manager: Kamisha Adria Shaw	**Signature:** 
Authorized By:	**Signature :**

Appendix 2: Final Graduation Project (WBS)



Appendix 3: Quality Control Report

DAILY CONTRACT QUALITY CONTROL REPORT
(SEE INSTRUCTIONS)

1. CONTRACT NUMBER	3. ABBREVIATED CONTRACT NAME		4. NAME OF CONTRACTOR (COMPANY NAME)
2. TASK ORDER NUMBER			
5. NOTICE TO PROCEED DATE	7. WEATHER AND TEMPERATURE		
	0800 HOURS	1200 HOURS	1500 HOURS
6. ACTUAL DATE STARTED			
8a. CONTRACTOR DESCRIBE WORK BEING PERFORMED (INCLUDE LOCATION OF WORK)			
8b. NUMBER OF WORKERS ON JOB	8c. NAME OF CONTRACTOR'S REPRESENTATIVE		
9. CONTRACTOR RECORD GOVERNMENT REPRESENTATIVE'S INSTRUCTIONS (IF ANY)			
10. CONTRACTOR DESCRIBE DIFFICULTIES ENCOUNTERED (INCLUDE DELAYS, DESCRIBE WORK NOT PERFORMED IN ACCORDANCE WITH THE CONTRACT, CORRECTIVE ACTIONS, ETC.)			
11. GOVERNMENT REPRESENTATIVE COMMENTS TO ITEMS 8, 9, AND 10; WAS A SITE INSPECTION PERFORMED OF ANY WORK? YES ☐ DATE OF INSPECTION _____ NO ☐ NA ☐			
12. CONTRACT COMPLETION DATE	13. PERCENT COMPLETE	14. QUALITY CONTROL SIGNATURE AND DATE	
15. QUALITY ASSURANCE SIGNATURE AND DATE		16. PROJECT MANAGER REVIEW (SIGNATURE AND DATE)	
17. COR OR CO SIGNATURE AND DATE		18. REPORT IS FOR DATE(S)	19. REPORT SERIAL NUMBER

Appendix 4: Project Charter

1.0 Project Identification		
Name	*Affordable Housing Project*	
Description	*Developing an affordable housing project that will aid in financial burdens of the community*	
Sponsor	Belmopan City Council	
Project Manager	Kamisha Shaw	
Project Team Resources		Communications, Policy, Healthy Workplace group,

2.0 PROJECT OBJECTIVES (PURPOSE)
▪ To create a living environment that that is safe and affordable ▪ To assist with better job opportunities ▪ To create a heightened level of stability through housing ▪ To foster growth and community unity

3.0 PROJECT SCOPE
▪ To address concerns in the Belmopan and surrounding area due to lack of affordable housing options. ▪ To construct a plan to carry out the initiative proposed. ▪ To incorporate relative knowledge areas to ensure the success of the plan

4.0 MILESTONE DATES		
Item	**Major Events / Milestones**	**Dates**
1.	Preliminary	May 12, 2020
2.	Long Lead Procurement	June 5, 2020
3.	Temporary Facilities & Services	July 9, 2020
4.	Foundation and ground floor	September 29, 2020
5.	Ground Floor Walls and Openings	October 13, 2020
6.	Form and Pour Concrete for 1st floor	November 23, 2020
7.	First Floor Walls and Openings	January 20, 2021
8.	Masonry work	May 18, 2021

4.0 MILESTONE DATES		
9.	Roofing	May 29, 2021
10.	Windows and Doors	June 3 2021
11.	Building finishes	June 12, 2021
12.	Plumbing	June 19, 2021
13.	Electrical	July 26, 2021
14.	Final Clean-up and Occupancy	November 5, 2021
15.	Complete Final Inspections	November 21, 2021

5.0 RISKS	
Severity	**Description**
1. Technical Risk	These risks can commonly occur when there are changes in project scope and requirements, and if there are design errors or omissions.
2. Management Risk	The most common management related risk is uncertain productivity of resources
3. Environmental Risk	Adverse weather conditions/natural hazards
4. Financial Risk	Funding, resettlements cost, and cost overruns
5. Reputation	After work maintenance

6.0 CRITICAL SUCCESS FACTORS

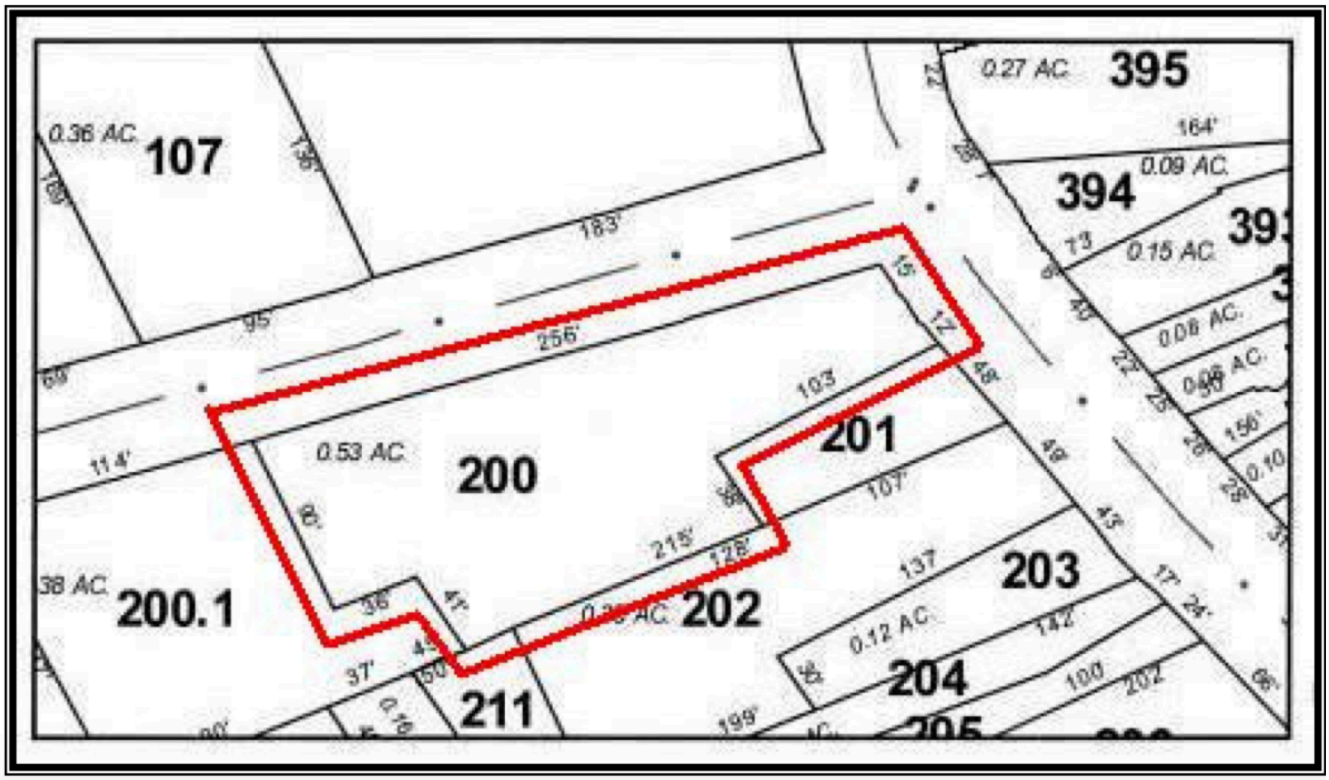
- Finishing the project on schedule
- Effective communication with all key players and stakeholders
- Effective collaboration
- Employee input into development and implementation of recognition activities
- Awareness of project purpose, priorities, objectives, goals and values

7.0 SIGNOFF

Project Sponsor:

Date: February 24, 2020

Appendix 5: Map of subject property



Appendix 5: Philology Review Letter

March 13, 2020

Academic Advisor
Master's Degree in Project Management (MPM) Universidad
para la Cooperacion Internacional (UCI)

Dear Academic Advisor

RE: Philological Review of Final Graduation Project submitted by Kamisha Adria Shaw in partial fulfilment of the requirements for the Master's in project management (MPM) Degree.

I hereby confirm that Kamisha Adria Shaw has made all the corrections to the Final Graduation Project document as I have advised. In my opinion, the document now meets the literary and linguistic standards expected of a student reading for a degree at the Master's Level.

Respectfully,

Jareth N. Reyes
B.Arts English