

VA



U.S. Department
of Veterans Affairs

Office of Construction &
Facilities Management



Critical Path Method design manual

DECEMBER 2012

Guidelines for Preparation of
Risk Management
Volume II

TABLE OF CONTENTS, Volume II

1.	INTRODUCTION.....	3
1.1.	Purpose and Scope.....	3
1.2.	Applicable Documents	4
1.3.	Definitions and Abbreviations	4
2.	DELIVERABLES.....	6
3.	PREPARING RISK MANAGEMENT PLAN (RMP).....	7
3.1.	Introduction	7
3.2.	Risk Management Approach.....	7
3.2.1.	Risk Management Objectives	7
3.2.2.	Project Success Factors	8
3.2.3.	Risk Management Methodology.....	8
3.3.	Risk Management Strategy Process Description	10
3.3.1.	Risk Identification strategy	10
3.3.2.	Risk Impact Assessment and Categorization.....	11
3.3.3.	Risk Response Plan	14
3.3.4.	Risk Reporting.....	16
3.3.5.	Risk Monitoring and Review	16
3.3.6.	Unforeseen Risk Process Description.....	17
4.	EXHIBITS.....	18
Exhibit II.1.	Sample Project Risk Register.....	19
Exhibit II.2.	Sample Risk Statement Form and Delphi Technique.....	20
Exhibit II.3.	Sample Fault Tree Analysis.....	21
Exhibit II.4.	Sample Risk Breakdown	22
Exhibit II.5.	Sample Risk Management Schedule	23
Exhibit II.6.	PertMaster and Monte Carlo Risk Simulation	24
Exhibit II.7.	Sample Risk Report’s Table of Content.....	28

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1. INTRODUCTION

1.1. Purpose and Scope

The United States Department of Veterans Affairs (VA) is the second largest government department in the country and, as well, the most comprehensive system of assistance for veterans. Construction projects undertaken by VA are complex and costly. They are typically threatened by different types of risks that may end up having impacts on some of the projects objectives. In order to identify and respond to those risks, the Architect/Engineer (A/E) for each project shall develop and maintain a comprehensive Risk Management Plan (RMP).

This document is intended to provide guidance to the Architect/Engineer (A/E) in the development of a Risk Management Plan (RMP) during the design phase of Medical Center Major New Facilities, Additions and Renovations projects by the United States Veterans Affairs (VA). The VA oversees complex projects throughout the country which require careful planning and execution during the evolution of the projects.

The purpose of the Risk Management Plan (RMP) is to identify, analyze, manage and control all risks that could have adverse impact to VA's project budget and schedule throughout all the phases of the project's life cycle. It also provides a useful road map that can be used by the A/E and the project team to assist them in completing the project successfully.

The RMP is intended to be a dynamic tool for risk project control, developed by the A/E (qualified risk expert) with input from all parties involved including the Office of Construction and Facilities Management (CFM) Project Manager, the Department of Veterans Affairs Medical Center (VAMC) Director and Facility Engineer, Veterans' Integrated Service Network (VISN) Capital Asset Manager, VA CAMPS Office, the Office of Strategic Management and Contracting Officer and Peer Reviewers. The RMP may be used as a reference by the Construction staff as it also encompasses risk analysis in the procurement, construction and activation phases.

This document is solely intended as a guide, it is not intended to dictate means and methods. The A/E is responsible to develop the means and methods and correlate with the VA requirements, as part of PG 18-15

1.2. Applicable Documents

The A/E shall apply the following set of document to develop the Risk Management Plan (RMP).

Document Title	Document Location
PG 18-15 A/E Submission Requirements for VA Medical Center Major New Facilities, Additions and Renovations.	http://www.cfm.va.gov/contract/ae/aesubmaj/
Design Manual for CPM Schedule & Risk Management for Architect/Engineers (A/E), Department of Veterans Affairs. December 2012.	http://www.cfm.va.gov/til/dManual/
Architectural and Engineering CPM Schedules. Section 01 32 16.01	http://www.cfm.va.gov/til/spec/
A Guide to the Project Management Body of Knowledge (PMBOK® Guide)	http://www.pmi.org/en/PMBOK-Guide-and-Standards/Standards-Library-of-PMI-Global-Standards.aspx
Project Management Institute (PMI). <i>Practice Standard for Project Risk Management.</i>	http://www.pmi.org/

Table - 1: Applicable documents for preparation of RMP

1.3. Definitions and Abbreviations

A/E:	Architect and Engineer. Person and/or entity in charge of the design phase of construction projects.
Delphi Technique	It is a technique that consists of answering questionnaires in two or more rounds where experts are asked about important project risks. Then, the answers are circulated among them for discussion and review, with the final purpose to obtain one accurate answer; each expert is kept anonymous.
Primary Risk	Risks that have major impact on the objectives of the project.
Project Risk Register (PRR):	It is a tool used in project risk assessment which helps to identify, analyze and manage risks.
Residual Risk:	Risks that once they have been mitigated remain there. This type of risk does not represent high level of danger to the project objectives.

Risk:	Risk is the combination of likelihood of any uncertain event or condition occurring and the consequences of the occurrence. The occurrence of these events or conditions might cause harm and/or loss to the project. However, it is important to keep in mind that not all risks adversely impact projects.
Risk Assessment:	It is the process that involves the usage of available information to determine the probability that identified events may occur and the level of consequence in the case of occurrence.
Risk Breakdown Structure (RBS):	This method consists of first of all, identify major risk categories, and then start breaking down them into more detailed ones.
Risk Identification:	It is the process which helps to determine what, how, and why unusual events may occur.
RMP:	Risk Management Plan.
Secondary Risks:	Risks that arise right after a risk response plan has been implemented.
VA:	US. Department of Veterans Affairs.

2. DELIVERABLES

According to VA PG 18-15, multiple submissions of the Risk Management Plan are required over a period of time that evolves throughout the project. The below table captures the phases and the level of detail in which the A/E shall submit the Project Risk Management Plan and Analysis for the VA review and comment:

Design Phase	RMP Deliverable
Pre-design	<ul style="list-style-type: none"> ● Project Risk Analysis (Preliminary Risk Management Plan). ● Recommendations for addressing major risks. ● Type of software, methodology and format that the A/E will use in order to be approved by VA.
Schematic Design (SD1)	<ul style="list-style-type: none"> ● Schedule Risk Analysis based on CPM for detailed design and project schedule.
Schematic Design (SD2)	<ul style="list-style-type: none"> ● Updated Schedule Risk Analysis along with the Risk Management Plan.
Design Development (DD1)	<ul style="list-style-type: none"> ● Updated Schedule Risk Analysis along with the Risk Management Plan and mitigation actions.
Design Development (DD2)	<ul style="list-style-type: none"> ● Updated Schedule Risk Analysis with increased detail in new risks and mitigation plan.
Construction Documents (CD1)	<ul style="list-style-type: none"> ● Updated Schedule Risk Analysis identifying new risks and mitigation actions, particularly in construction areas.

Table – 2: Required Deliverables

3. PREPARING RISK MANAGEMENT PLAN (RMP)

Based on a thorough review of the project scope, stakeholders' requirements, and project constraints project environment, the A/E shall prepare the RMP. The RMP document shall include the following:

3.1. Introduction

In this section the A/E shall introduce the RMP, provide brief definition of key risk management terminology, summarize the purpose and scope of the document, and state the pertinent VA medical center project.

3.2. Risk Management Approach

In this section the A/E shall introduce the approach that he/she will use to develop the RMP. The A/E shall at least explain the following:

3.2.1. Risk Management Objectives

The A/E shall list the objectives (from the top level) of the project's risk Management process. For example, some objectives could be:

- Accomplish all the minimum Medical Facilities standards of VA's *Architectural Design Manual for (1) New Hospital; (2) Replacement Hospitals; (3) Ambulatory Care; (4) Clinical Additions; (5) Energy Centers; and (6) Outpatients Clinics* issued on May 2006.
- Maximize the probability of achieving successfully the project's objectives within the planned approved budget.
- Maximize the probability of completing the whole project within time frame stated in the project specifications.
- Identify and assess project risks that threaten the progression of the project, as well as, the adverse impact that these could bring up throughout the life cycle of the project.
- Generate risk mitigation plans as the basis for determining the budget needed to cover such plans, as well as, the allocation of these resources throughout the project life cycle.
- Communicate to all stakeholders (CFM Project Manager, VAMC Director and Facility Engineers, VISN Capital Asset Manager, VHA Camps Office, peer reviewers, Commissioning Agent, and other stakeholders) involved in the project the identified risks, as well as the responsibility roles of all of them.

- Define the cost estimate for risk contingency plans in order to determine the project maximum cost reserve.

3.2.2. Project Success Factors

The A/E shall list and describe project success factors which help all stakeholders to understand those meaningful elements that need to be accomplished in the process. Those factors need to be related to the fact of identifying the best approach for reducing risks to acceptable levels. The A/E shall recognize and list all general success factors such as (The A/E should refer, but not limited, to these factors):

- The A/E shall recognize the Risk Management process as a valuable discipline which provides positive and potential effects on project objectives, project stakeholders and team members.
- The A/E shall convey to all stakeholders and team members involved in the project the importance of having an open and honest communication among all of them. Overt and honest communication will increase effectiveness of the Risk Management Plan in terms of decision-making and plan implementation.
- The A/E shall convey to all stakeholders and team members the importance of establishing the final scope of work that does not require many changes after Schematic Design 2 (SD2).
- The A/E shall convey to all stakeholders and team members the importance of completing the final budget and schedule by Schematic design 2 (SD2) phase, and as well, all the risks that may impact accomplishing these two objectives.

3.2.3. Risk Management Methodology

The A/E shall define the methodology to be used to identify and manage such events (risks) that threaten accomplishing the goals of the project; one of the methodologies usually used out there in the industry is Monte Carlo risk simulation, which could be an optional tool for A/E to be implemented in the development of the RMP. Furthermore, the A/E shall establish the components of the process to be used when developing the RMP. The A/E shall at least include the following components within the process:

- Establish the project's objectives and stakeholders' responsibilities.
- Identify as many risks as possible.
- Analyze and assess risks (Optional method is Monte Carlo simulation).
- Evaluate the best response action to risks.
- Develop risk contingency plans.
- Report Risks.
- Review and monitor risk.
- Assess unforeseen risks.

3.2.3.1. Roles and Responsibilities

List and describe the risk management responsibilities delegated throughout the project organization. The A/E shall develop a table that contains risk activity and responsibility which includes at least the following elements (See Table 2 as a reference):

Risk Activity	Responsibility
Risk Identification	All project stakeholders
Risk Assessment	All project stakeholders
Risk Response	Risk Project Manager, A/E (recommend) and VA (approval)
Risk Contingency Plans	Risk Project Manager, A/E (recommend) and VA (approval)
Risk Reporting	Risk Project Manager and all stakeholders (feedback)
Risk Monitoring and Review	All project stakeholders

Table - 3: Risk Management Responsibilities (Reference example)

An effective Risk Management is contingent on comprehensive contribution from stakeholders involved in a project. Any experience, comment, thought, or concern that is gathered would help to ensure that risk occurrence is swiftly and effectively addressed. It is important that those involved in the project are committed to provide as much information as possible in order to develop a credible RPM. The best strategy for engaging stakeholders to communicate any existing and possible risk in a project is by assigning risk management responsibilities. This practice encourage each person involved in the project to be more effective and moreover to picture the overall scope of the Risk Management Plan (RMP).

3.2.3.2. Risk Identification Tools

List and describe each of the risk identification tools to be implemented to develop the RMP. For instance, such tools could be: (the selected tool is up to the project manager’s criteria).

- Brainstorming.
- Interviews.
- Risk Statement Form. (See Exhibit 2)
- Fault tree analysis. (See Exhibit 3)
- The Delphi technique. (See Exhibit 2)

A good strategy when sitting down with the risk team for identifying risks is to perform a Risk Breakdown Structure. This Approach strategy is very useful to categorize risks

since it presents different levels and scenarios of the project where adverse events can occur. (See Exhibit 4 as a reference)

3.2.3.3. Risk Management Schedule

Develop a Risk Management Schedule with milestones, taking as a reference the Integrated Master Schedule. The Risk management schedule should include activities such as reviews, meetings, assessment milestones, and other significant events that are included in the Risk Management plan development.

The A/E shall refer to “*Architectural and Engineering CPM schedules; Section 01 32 16.01. Numeral 1.13 Project design schedule risk analysis/mitigation plan*” in order to conduct the Risk Schedule. (See Exhibit 5 as a reference)

3.3. Risk Management Strategy Process Description

In this section the A/E shall describe the process to be used for addressing risks from the identification stage to the monitoring and reviewing stage. It is important to highlight that this process takes place throughout the whole project’s life cycle. The A/E shall at least present the following stages:

3.3.1. Risk Identification strategy

The A/E shall identify as many risks as possible throughout the project’s life cycle. Using the selected identification tool from *Section 3.2.3.2*, identify as many risks as possible, being careful to distinguish authentic risk (e.g. primary and secondary risks) from non-risk or risk with no adverse impact to the project (e.g. residual risks).

Describe how the identification process is managed, for example who is responsible for this task, how this task is planned to be addressed, and when it is planned to be performed. Be clear and concise.

Some of those possible risks that the A/E may deal with are presented below: (The A/E should refer, but not limited, to this list)

- Change of scope of work
- Failure to involve stakeholders early in the process.
- Lack of communication between stakeholders.
- Lack of work flow control (Implementation of detailed Schedule).
- Design may be inadequate.
- Architect/Engineer (A/E) staffing may be inadequate.
- Acquisition of permits.

- Long lead/Critical Equipment and Material.
- New Government Regulations.
- Low bids that become difficult to execute.
- Contractor's bid withdrawal.
- Termination of contract due to contractor's default.
- World Market.
- Environmental issues.
- Programming issues.

The A/E shall record the person and/or entity that identified the risk, as well as, the date (trigger date) when the risk may occur in the instance where corrective measure/plans have not been implemented to respond to such risks.

The A/E shall develop a single comprehensive Project Risk Register (PRR), see exhibit 1, that can be regularly updated throughout the project's life cycle and activation phase where all the information shall be documented.

The register shall include recommendations of response for the identified risks as well. Refer to exhibit 1 for more detailed information about how the A/E should document all identified project risks in the Project Risk Register (PRR). The VA requires performing the Project Risk Register (PRR) as per "The Network Analysis Schedule specifications." Section 01 32 16.01.

3.3.2. Risk Impact Assessment and Categorization

The A/E shall select the appropriate analysis method to address risks and he/she shall justify the selection of such method.

There are two different analysis methods to assess the risks. The first method is known as Qualitative Analysis which assesses and evaluates characteristics of identified risks and prioritizes them based on agreed-upon standards. Quantitative Analysis is the other method, which consist of providing a numerical estimate of the overall consequence of adverse events on the project's objectives.

3.3.2.1. Qualitative Risk Analysis

If Qualitative Risk Analysis is the selected method, The A/E shall follow the steps presented below in order to implement this method.

Step 1 - Probability of Risk Occurrence

For each identified risk, assess and categorize the risk event in terms of probability of occurrence. The A/E shall collect all the comments and input from all stakeholders and then use table 4 to determine the probability level. The A/E shall ensure to document all

the information obtained from this categorization in the Project Risk Register (PRR). This step shall be performed periodically throughout the project’s life cycle once new risks are identified, in order to update the Project Risk Register (PRR) and therefore enhance the risk analysis.

Probability Level	Probability	Probability of occurrence
4	Very High	>75%
3	High	>50%
2	Moderate	>25%
1	Low	>1%

Table - 4: Probability of Risk Occurrence classification.

*Activities with probability of occurrence less than 1% can be neglected.

The A/E shall ensure that all stakeholders will provide constructive inputs to obtain accurate results. Refer to exhibit 1 for more detailed information about how the A/E should assess project risks under this step

Step 2 - Consequence of Risk Occurrence

Once risks are classified by probability of occurrence, the second step is to assess and classify identified risks in terms of the level of consequences on the project in case of risk occurring. Use Table 4 to perform such categorization. This classification also determines the area of impact of where risk will occur. The A/E shall accommodate each risk into the different categories and then determine the level of consequence. This information shall be documented in the Project Risk Register (PRR).

The A/E shall ensure that all stakeholders will provide constructive inputs to obtain accurate results. Refer to exhibit 1 for more detailed information about how the A/E should assess VA project risks under this step.

After determining the probability and consequence level for each identified risks, they need to be ranked in such a way that those with high level of occurrence and greater consequences must be prioritized in the “Risk Response Plan.”

Category	Description	Consequence level	Consequence
Cost	The consequence of a risk event will directly impact the project's budget.	4 3 2 1	Very High High Moderate low
Scope	The consequences of a risk event will affect the final product of the project and/or a single phase.	4 3 2 1	Very High High Moderate low
Schedule	When a risk event delays the completion date of a project and/or a single activity, concurrently, it is increasing the cost and may result in a reduction of scope and quality of the project.	4 3 2 1	Very High High Moderate low
Quality	Frequently, this impact category is overlooked because it is in here where most of mitigation plans are implemented.	4 3 2 1	Very High High Moderate low

Table - 5: Consequence of Risk Occurrence classification

Step 3 - Risk Ranking

Prioritize identified risks based on the results obtained from the previous numerals (2.3.2.1.2. and 2.3.2.1.3.). The following ranking scale table (See table 5) can be used as a guideline to assess risk response plan priorities. The A/E shall document the results of this risk ranking in the Schedule Risks Register. Refer to exhibit 1 for more detailed information about how the A/E should assess project risks under this step.

Probability Level	4	Medium	Medium	High	High
	3	Low	Medium	Medium	High
	2	Low	Low	Medium	Medium
	1	Low	Low	Low	Medium
		1	2	3	4

Consequence Level

Table - 6: Ranking scale (Probability level Vs. Consequence level)

- High: Risk that represents a high level of damage to the project objective. A rapid risk response plan is required to reduce high level risks either to medium or low level (Consider to implement new method or change the scope of the project).
- Medium: The risk is moderate; however, it can be dangerous to some elements of the project (Consider alternative methods).
- Low: it represents a minimal hazard to the project (Does not need rapid response but it does need to be monitored)

3.3.2.2. Quantitative Risk Analysis

If Quantitative Risk Analysis is the selected method, The A/E shall incorporate Monte Carlo risk simulation methodologies such as PertMaster¹ (See Exhibit 6 for detailed information about how this software is used). These tools help to estimate the project risks when all risks are considered simultaneously. In order to implement this method the A/E shall pursue, but not limited, the following activities:

- Analyzing and picturing very well all projects objectives, a good way to do that activity is by sorting objective by project schedule or cost estimate.
- Identifying all risk on individual project elements such as schedule or line-item costs.
- Including general risks that have broader consequence on the overall project.
- Applying quantitative tools to determine the overall impact of the risks on the project's objectives.

The A/E shall apply Quantitative Risk Analysis during the design of large complex projects in order to validate the durations of the design activities. The probability of accomplishing the scope of work within the planned durations should be at least 50% or better, preferably at 70% level. The A/E shall perform such analysis at the VA's discretion.

3.3.3. Risk Response Plan

The A/E shall recommend VA to select the best risk response action to be taken in order to proceed with generating risk contingency plans. This recommendation is made based on the ranking given to the risks.

The A/E is also responsible to provide recommendations to VA for possible risk contingency plans that help VA to determine the best set of action that correctly address risks.

¹ This methodology example is solely intended as a reference, it is not intended to dictate means and methods. The A/E is responsible to develop the means and methods and correlate with the VA requirements, as part of PG 18-15

3.3.3.1. Risk Response Action

Select the appropriate response for each identified risk. The probability and consequences of risk occurring will be the basis for deciding which action should be taken to address the risk.

The A/E shall document these actions in the Project Risk Register (PRR) in order to be presented to VA (Refer to Exhibit 1 for more detailed information about how the A/E should document these responses). The following actions are the four basic ways to manage a risk:

- **Avoid:** Change in the objectives and scope of the projects may result in avoiding the risk. This type of response need to be notified to VA.
- **Transfer:** Shift the responsibility of the risk to a third party. This action does not eliminate the risk.
- **Mitigate:** If the risk cannot be avoided, mitigation plans need to be implemented to reduce the probability and/or consequences of the risk
- **Accept:** When risk cannot be avoided and mitigated, and acceptance is the only response, the A/E shall include a risk estimating cost into the project's budget and shall update the project's schedule in order to provide the VA with an order of magnitude of the risk's impact. If the risk is accepted, a written note must be submitted stating the acceptance of the risk.

3.3.3.2. Risk Contingency Measure/Plan Process

List and explain how contingency measures/plans will be managed in order to determine the set of actions which will increase the probabilities of successfully achieving the project's scope. Such measures/plans need to be documented in the Project Risk Register and then presented to VA for approval (Refer to Exhibit 1 for more detailed information about how the A/E should document these contingency measures/plans). It is recommended to concentrate, at least, on the following factors.

- Communicate to all members involved in the project all the identified risks, the area of the project that is/will be affected, their risk's root, and their impact to project objectives.
- Identify risk owner and assigned responsibilities. Risk owners should be aware of what is expected from them.
- Agree upon what risk response action (avoid, transfer, mitigate, and accept the risk) will be taken to address the risk.
- Specify the time of when agreed-upon responses will be executed.
- Estimate the resources, costs, and duration of each response plan. This estimation has to be approved by the project manager and owner, and it is the risk owner's commitment to accomplish it.

- Implement risk response plans.
- Track and review risk response plans. It is responsibility of every Stakeholder involved in the project to oversee response plans in order to verify on how effective the results are; otherwise, actions need to be taken. Response activities should be documented and reviewed periodically.

All contingency measures/plans are to be reviewed and updated throughout the project life cycle if necessary; furthermore, the A/E need to publish and distribute them to all those directly involved in the execution of the project. These plans need to come along with a contingency plan schedule, as well with a contingency resources estimating plan.

The latter means that the A/E shall estimate and document all resources, such as money, equipment and labor that are needed for the execution of the contingency plan. If this estimation incurs in extra cost, the VA will be informed and the cost will be included in the budget of the project.

3.3.4. Risk Reporting

The A/E shall describe what format reports are planned to be used, to whom they are submitted and the frequency. The A/E shall document this information in the Project Risk Register (PRR) as well. Reports must contain every action that is taking to address the occurrence of a risk. The A/E shall include into the reports at least the following information (See Exhibit 7 for more detailed information of common risk reporting format):

- Dates of action.
- Corrective actions.
- Change requests.
- Updates to risk plans.
- The effectiveness of risk mitigations activities.
- Identification checklist.
- Detailed Risk Register and so on.

These reports must be submitted in every deliverable and also in each design review to the VA for progress review (Refer to required deliverable in section 2.). All reports must be archived for future projects.

3.3.5. Risk Monitoring and Review

The A/E shall update the Project Risk Register in a monthly basis and be ready to discuss it with the VA during monthly meetings in order to implement corrective actions, identify additional risks, update the Risk list, and review change requests.

3.3.6. Unforeseen Risk Process Description

Every unforeseen risk must be immediately notified to the project manager and stakeholders. The person or individual who identified the risk will assess the situation. If necessary the A/E shall notify VA in order to implement risk response plans to address such situations. This issue must be documented in case of the occurrence in the Project Risk Register (PRR).

4. EXHIBITS

Exhibit II.1. Sample Project Risk Register

Exhibit II.2. Sample Risk Statement Form and Delphi Technique

Exhibit II.3. Sample Fault Tree Analysis

Exhibit II.4. Sample Risk Breakdown

Exhibit II.5. Sample Risk Management Schedule

Exhibit II.6. PertMaster and Monte Carlo Risk Simulation

Exhibit II.7. Sample Risk Report's Table of Content



EXHIBIT II.1

Veteran Affairs
Risk Register
Date

Risk Identification							Risk Assessment								Risk Response Plan			Risk Monitoring and Control						
Risk Number	Name of Risk	Description of Why Risk Occurs	Type of Risk	Identified by	Date Identified	Trigger Date	Responsibility	Probability of Occurrence %				Consequence of Occurrence				Area of Impact	Specific Area	Ranking	Response Action (Avoid, Transfer, Mitigate, Accept)	Response Measure/Plan	Completed Actions	Planned Future Actions	Risk Status (Open/Happened/Closed)	Status Date
								(1) Low	(2) Moderate	(3) High	(4) Very High	(1) Low	(2) Moderate	(3) High	(4) Very High									
Design Phase (ID=DP)																								
DP-00	Change scope of work	The scope of work is changed after the Congress has been told about the budget needed for such preliminary design.	Cost, Scope and Schedule	The VA and The A/E	April 10, 2011	June 10, 2011	The VA								X	Cost, Scope and Schedule	New required designs, more time consume and budget	X	Avoid	I shall be performed a better and accurate preliminary design to be submitted to the Congress. It shall be created a pre-design phase where this issue can be taken care of.				
DP-01	Failure to involve stakeholders early in the process	Some parties are not deeply involved during the design phase process, who can contribute with valuable inputs for the benefit of the project.	Cost and Schedule	The A/E	May 12, 2011	June 30, 2011	The A/E									Cost and Schedule	Changes on the designs	X	Avoid	The VA shall take into consideration incorporating a person or entity (such as a Project Manager) into the project who has the experience to deal with this type of project and who can manage this situations. Activities such as meeting, monthly reports, and/or presentations can be implemented to get everyone to have knowledge about all the issues that could have adverse impact to the projects objectives.				
DP-02	Lack of communication between stakeholders	The VA and the A/E do not have easily access to every document that is performed by each party and do not communicate everything amongst them.	Cost and Schedule	Project Manager	May 12, 2011	June 30, 2011	The A/E									Cost and Schedule	It will cause major disagreement and therefore, possible change orders	X	Avoid	The A/E shall use an on line system where all documents (such as design drawings, letters, requests and etc) can be stored where all stakeholders can easily access to it. Moreover, it is responsibility of the Project Manager to communicate with everyone involved in the project, for example by using method such as meetings.				
DP-03	Long lead/Critical Equipment and Materials	Identified long lead/critical equipment and materials will be procured to the site after the planned substantial completion date of the project, as long as the contractor is the one who deals with these items.	Cost and Schedule	The VA's consultant	June 01, 2011	May 21, 2012	The A/E									Cost and Schedule	It will affect the completion of the projects where such material and equipment belong	X	Mitigate	By the time of acquiring those long lead/critical equipment and materials by Contractor, the planned substantial completion date will be reached. It is for that reason that the VA shall procure those critical elements ASAP in order to get them on time. The VA shall provide such resources to avoid any potential delay.				
DP-04	Site Information	The existing land has not been explored in detail in order to have an accurate information from the site that is to be stated on the specifications of the project.	Schedule	The A/E	May 22, 2011	June 24, 2011	The VA									Schedule	Lack of information on the Specs will affect the progress of work	X	Avoid	The VA shall collect as much information as possible from the job site by conducting accurate site layouts, site surveys, site file safety consideration, civil/geotechnical inspections and environmental site assessment in order to have good and detailed site information on the Construction Specifications				
DP-05	New Government Regulations	New construction standards issued by the Government will create the need of make changes on the current design drawings of the project.	Scope	The A/E	May 29, 2011	May 21, 2012	The VA									Scope	Directed change orders	X	Accept	Since this Risk is to be accepted, the VA shall plan ahead to incorporate within the project budget an extra amount of money that will be used for events of this nature.				
DP-06	Lack of work flow control during the design phase.	The A/E does not have a detailed activity schedule where he/she can track the sequence of work.	Cost and Schedule	The VA	May 21, 2011	August 03, 2011	the A/E									Cost and Schedule	Bad interpretation of work sequence which cause delays	X	Avoid	The VA shall require the A/E to create a detailed cost loaded schedule that encompasses every phase within the design phase in order to track the sequence of work. The VA shall require the A/E to submit the payments along with an updated schedule so the VA will be able to track the A/E progress.				
DP-07	World Market	Due to the uncertainty of the Country's economics nowadays the prices of different materials and equipment could vary radically which may cause the contractor's sources being insufficient to execute the project once the contract is being awarded.	Schedule	The A/E	June 5, 2011	May 20, 2012	The VA									Schedule	Lack of material and equipment affect the progress of the work	X	Avoid	The VA along with the A/E shall analyze and perform a detailed background investigation on the Contractor's capabilities (resources and experience) on executing the project in case of an adverse event occurs throughout the process, before awarding the contract.				
DP-08	Personnel demand	Current projects that are being constructed in the area at the same time to this project have absorbed most of the qualified labor personnel whom are to be required to execute the VA's project.	Schedule	The A/E	June 7, 2011	May 21, 2012	The VA									Schedule	Lack of qualified personnel affect the quality of work	X	Accept	Since this Risk is to be accepted, the VA shall plan ahead to incorporate within the project budget an extra amount of money that will be used for events of this nature.				
DP-09	Environmental Control	Dust and debris generated from construction/demolition activities can contain a mold or fungus, which, if inhaled by immune-compromised patients, can cause disease and even death.	Schedule	The A/E	June 7, 2011	September 03, 2012	The Contractor									Schedule	Patients of hospitals	X	Avoid	The VA shall require the General Contractor to use appropriate dust mitigation measures during all construction activities at the Medical Center. Such measures could be for example, pre-construction dust site inspections, usage of efficient enclosure system and/or vacuum systems. The GC shall submit in written each of the measures to be implemented for the VA approval.				

Legend

Risk Number: Each identified risk must have a unique number ID. It must start with two letters (initials of the phase where the phase belong), plus a number.
 Name of Risk: Each identified risk need to be named with a generalized description of the causes of the risk.
 Type of Risk: Select from categories as defined by the Risk Management Plan.
 Identified by: State the person and/or party who identified the risk.
 Date Identified: Date risk identified.
 Trigger Date: Specifically the date the risk will become a realized issue/problem.
 Probability of Occurrence %: Provide the probability of risk occurrence in percentage, based on the range defined by the Risk Management Plan.
 Consequence of Occurrence: Mark with an X the boxes the level of consequence the risk have on the project, based on the list defined by the Risk Management Plan.
 Specific Area: Briefly describe the specific area that maybe impacted by risk occurrence.
 Ranking: Mark with an X the ranking where the risk belong, based on the probability of occurrence / consequence of occurrence previously selected.
 Low: It represents a minimal hazard to the project (Does not need rapid response but it does need to be monitored).
 Medium: The risk is moderate; however, it can be dangerous to some elements of the project (Consider alternative methods).
 High: Risk that represents a high level of damage to the project objective. A rapid risk response plan is required to reduce high level risks either to medium or low level.
 Response Action: select the best response action as defined by the Risk Management Plan.
 Response Measure/Plan: Explain how contingency measures/plans will be managed in order to determine the set of actions which will increase the probabilities of successfully achieving the project's scope.
 Risk status: State whether it has been triggered or not; the plan has been completed, and etc.
 Status Date: The latest update of the status of the risk.

EXHIBIT II.2

SAMPLE RISK STATEMENT FORM AND DELPHI TECHNIQUE

The following is a sample risk statement form to be used for identifying risks. This form may be customized and enhanced while implementing the Risk Management Plan process.

Risk Identification	
Name of person doing assessment:	Richard Whiteside (Name is kept anonymous)
Date:	April 10. 2011
Activity / Procedure being assessed:	Needs of a Medical Center in the Area
Description of why risk occurs:	The Medical Center needs to be built in a larger scale due to the required demand in the area. More budget is required for such change.
Type of risk	Scope and Cost
Who is at risk?	The VA
Risk Assessment	
Who is responsible for the risk:	The VA
Probability of occurrence:	(Very High, High, Moderate, and Low) There is an 89% of probability that such change needs to be performed
Consequence of occurrence:	(Very High, High, Moderate, and Low) The consequence is very high, since this change will highly increase the budget assigned by the Congress
Area of Impact in the:	The scope of work will be affected and therefore the budget of the project.
Duration of Risk in case of occurring:	This estimation resubmission to the Congress would take around 30 calendar days.
Risk Response Plan	
Action to be taken in case of occurring:	(Avoid, Accept, Mitigate, and/or Transfer) Avoid it
Possible Response plan:	It should be performed a better and accurate preliminary design to be submitted to the congress. It may be created a pre-design phase where this issue can be taken care of.
Estimated response plan cost:	N/A
Risk Control	
Status of risk:	N/A. Risk has not occurred yet.
Signature of Assessor:	

EXHIBIT II.3

SAMPLE FAULT TREE ANALYSIS

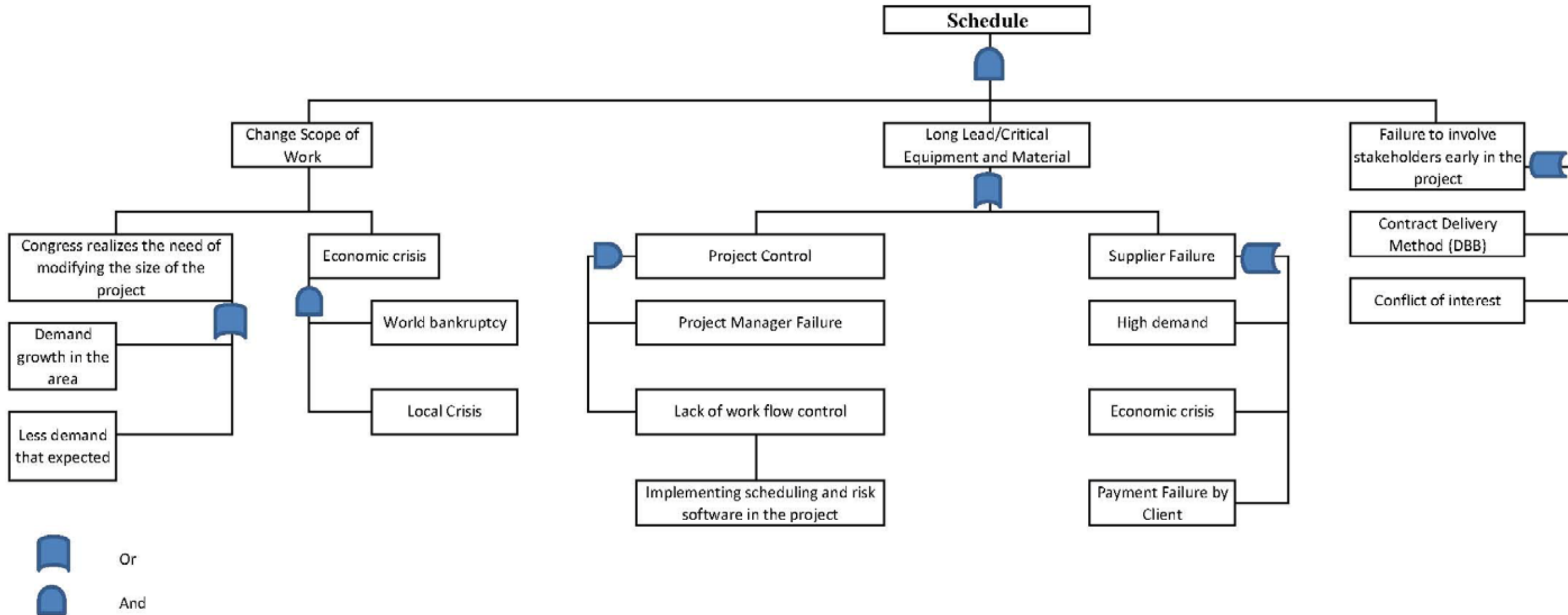


EXHIBIT II.4

SAMPLE RISK BREAKDOWN

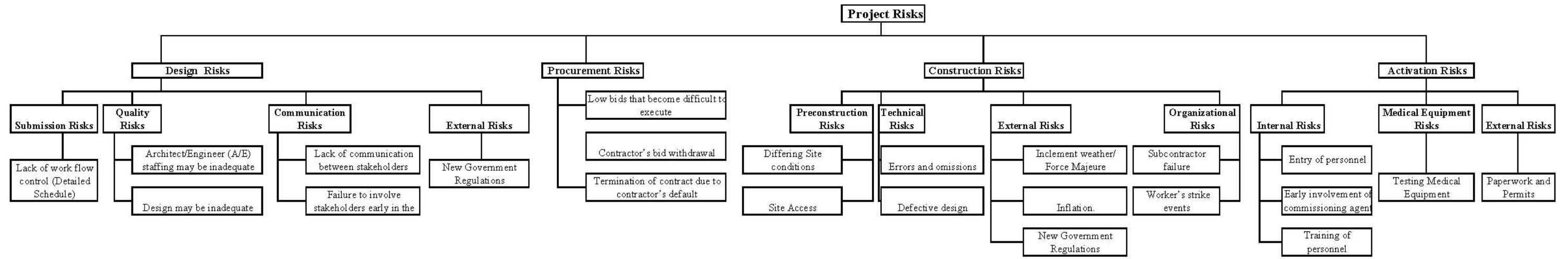


EXHIBIT II.5

Department of Veterans Affairs		VA Risk Management Plan Schedule				Construction & Facilities Management			
Activity ID	Activity Name	OD	Start	Finish	2011	2011	2011	2011	2011
VA RMP Schedule					Jul	Aug	Sep	Oct	Nov
A1000	Start Development of RMP	22	21-Jul-11	19-Aug-11					
A1010	Risk Identification Performed by all Project Stakeholders	0	21-Jul-11						
A1020	Risk Assessment Performed by all Project Stakeholders	5	21-Jul-11	27-Jul-11					
A1050	Risk Contingency Plans Proposed by A/E	5	21-Jul-11	27-Jul-11					
A1030	Risk Response Proposed by A/E	5	28-Jul-11	03-Aug-11					
A1060	VA Review and Comment on Proposed Risk Contingency Plans	5	28-Jul-11	03-Aug-11					
A1040	VA Review and Comment on Proposed Risk Response	7	04-Aug-11	12-Aug-11					
A1070	Risk Reporting Proposed by A/E	7	04-Aug-11	12-Aug-11					
A1080	Meeting for All Project Stakeholders to Review and Comment on Risk Reporting	5	15-Aug-11	19-Aug-11					
A1090	Risk Monitoring and Review Throughout Duration of Project by All Project Stakeholders	1	19-Aug-11	19-Aug-11					
A1100	End Development of RMP	0		19-Aug-11					

Page 1 of 1
Data Date 21-Jul-11

█ Remaining Level of Effort
 █ Remaining Work
 █ Actual Work
 ◆ Milestone
 ◀ Critical Remaining Work
 ▶ Summary

PERTMASTER AND MONTE CARLO RISK SIMULATION

PertMaster is a Risk Management software that uses Monte Carlo risk simulation methodology. This methodology requires some knowledge of probability and statistics but provides a software based on probabilistic approach to risk including some very useful features. This software provides a wide range of duration distributions for various impact ranges, with more flexibility and power than more simple probabilistic methods that typically use three point probability assessments. PertMaster basically looks at each task that has a distribution and sets its duration to a value between the minimum and maximum. When triangular distribution (See figure 1 below) is to be used, PertMaster sets the duration to the most likely more often than any other value. The least possible value to occur is considered an extreme value; i.e. the minimum and maximum duration. Once the impact ranges are established, the software runs repeated calculation iterations using each of the duration estimates, until the range of completion dates narrows and additional iterations do not show additional spread and the normal distribution of dates is reasonably well established. Discrete and discontinuous risk events can be incorporated and used in the simulation as well as running statistical modeling of uncertainty in durations. Once the analysis is complete the first thing it has to be done is look at the change of finishing by a certain date.

Results from the use of PertMaster include the probability of achieving various completion dates, which can be used to help the client choose the right confidence level for the selected project duration (see figure 2 below, as an example of how PertMaster provides these results), as well as the budget cost (See figure 3 below).

The use of PertMaster is particularly useful in conceptual and feasibility scheduling when durations are even less certain; and often, it is found that Contractor's planned completion dates fall within a very low range of probability, usually due to lack of Risk Management planning. This means that it is very important for Risk Management to use simulation methodologies that require very good schedule techniques, with appropriate logic and accurate estimated durations. Furthermore, when a subcontractor or trade contractor is known not to be a strong performer, PertMaster allows specific trades to be isolated and risk analysis can be run at a different rate or profile on just those trades, allowing customized risk analysis. This is very useful in Design-Bid-Build work where there is a tendency to accept low bids which include historically weak trade contractor performance.

Some of the other features that can be yielded from the use of PertMaster are complex metrics that cannot easily be extracted from a schedule by other means, like the Criticality Index (Figure 4 below), which identifies the times that an individual activity

EXHIBIT II.6

shows up on different Critical Paths (strictly the percentage of iterations that the activity appears on the Critical Path). This provides for better monitoring ability since these are the activities that are going to be more likely to delay the project. Sensitivity Analyses, correlating activity duration and project duration, produce “Tornado” charts (Figure 5 below), listing the major obstacles to completing the project.

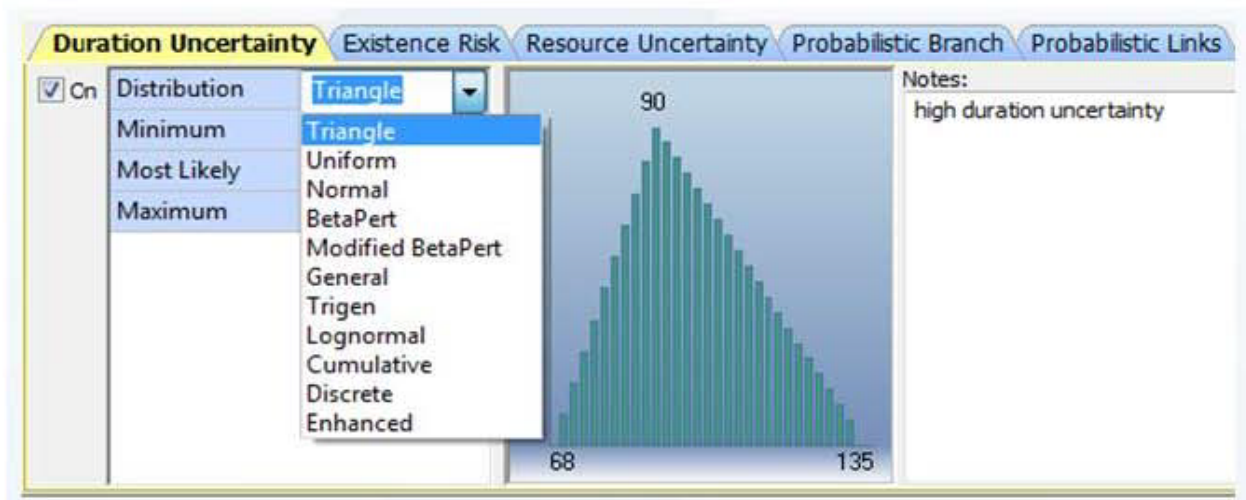


Figure 1. Triangular distribution or three 3 point analysis can be set for duration and cost.



Figure 2. Finish date histogram . The bars on the graph represent how often during the analysis the plan finish on certain date or between a certain date range¹.

¹ Risk Tutorial. Primavera PertMaster V8.5, Installation Manual, January 1, 2009.

EXHIBIT II.6

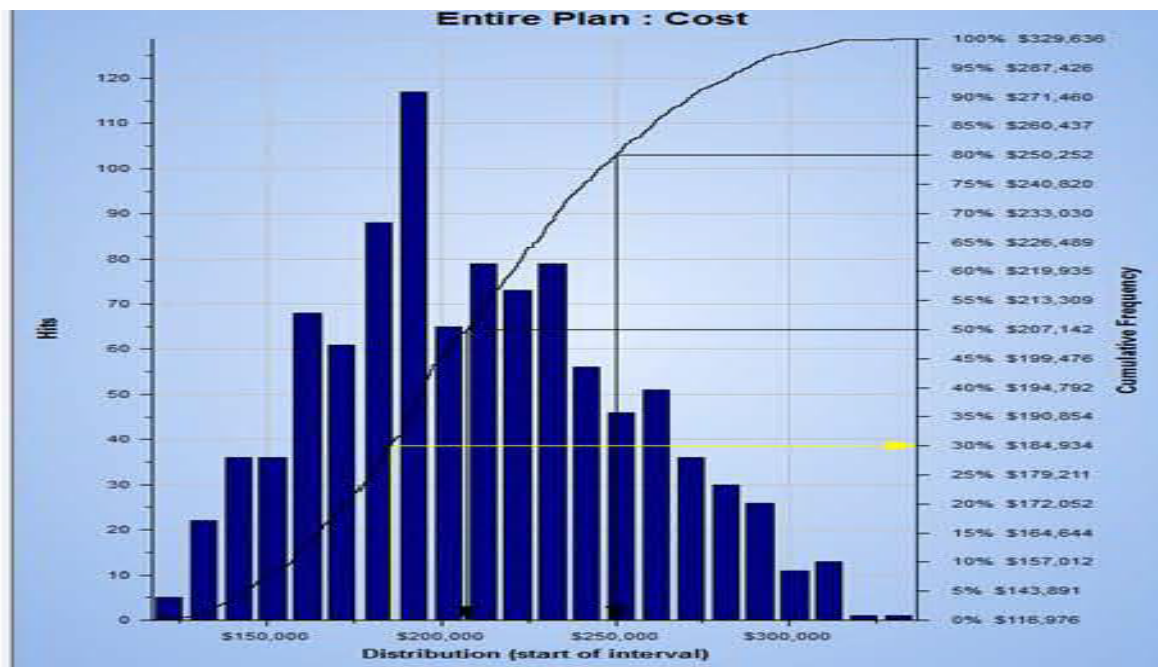


Figure 3. Finish date histogram. The bars on the graph represent how often during the analysis is the plan finish on certain budget cost or between a certain cost range².

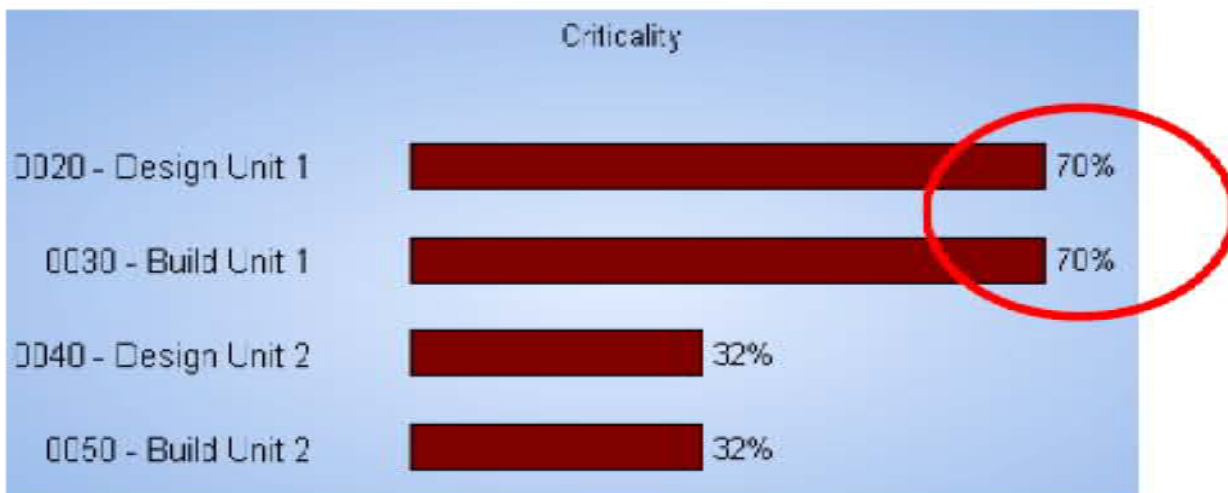


Figure 4. Criticality Index: the percentage of iterations each activity was critical³

² Risk Tutorial. Primavera P6 v8.5, Installation Manual, January 1, 2009.

³ Emerald Associates. Project Risk Analysis (with Primavera). AACE Toronto Section, October 2, 2008.

EXHIBIT II.6

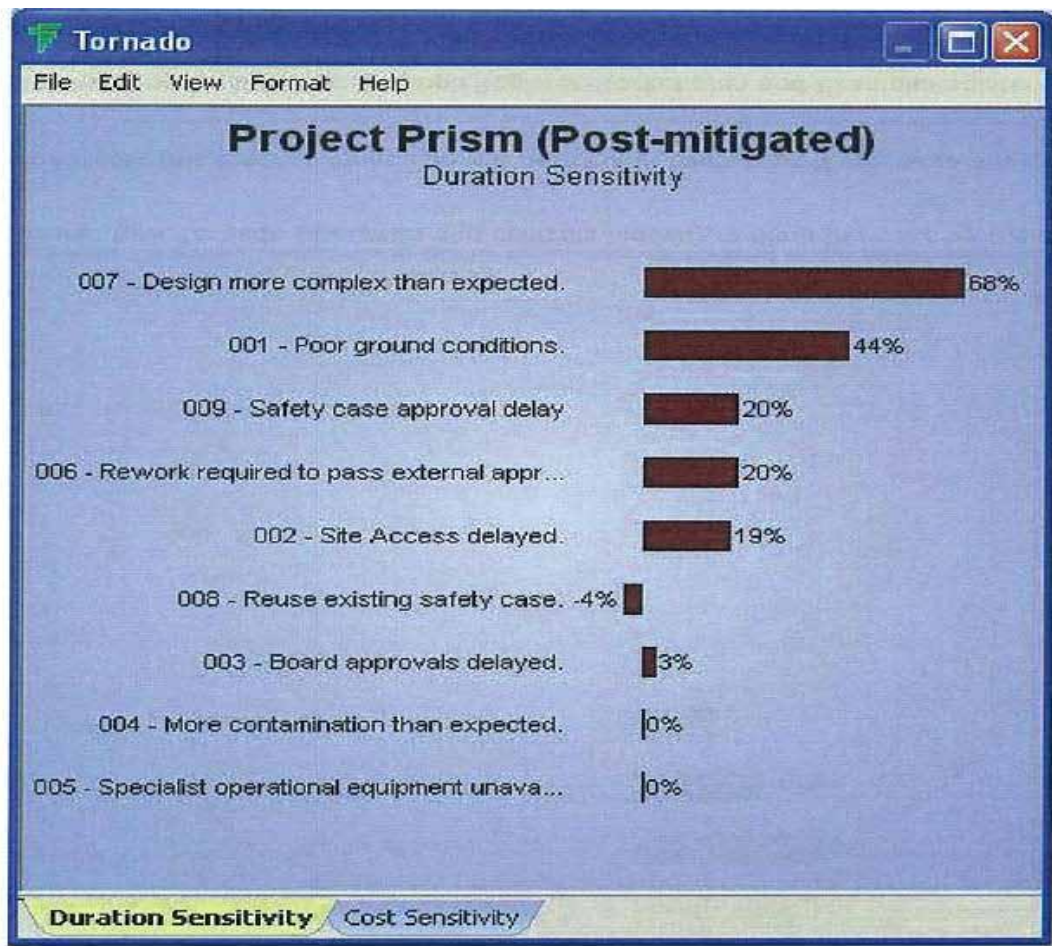


Figure 5. "Risk Tornado (Statistics and controls hidden) ranking the risks by their impact on the project completion date"⁴

EXHIBIT II.7

SAMPLE OF RISK REPORT'S TABLE OF CONTENT

Table of Content

Executive Summary - Briefly summarize the main report; include items such as report purpose, VA background, scope of the project, methodology, risk assumptions, and mitigation recommendations. The summary must be short and concise.

1. Purpose - In this Section needs to be presented, but not limited, the purpose of the report, as well as project's general description that includes name of the project, location, elements related to cost and schedule

2. Project Scope - In this Section needs to be presented, but not limited, project technical scope such as estimates, budget costs, design phase main elements, construction main elements, and schedule as developed and presented by. In addition, based on VA requirements and the established RMP, estipulate the dates when the reports will be submitted, as well as the person or entity to whom it will be submitted.

3. Methodology - In this Section needs to be explained the methodology that was implemented during the process, for example, list of risk team members and responsibilities, methodology implemented to identify risks, type of analysis performed (Qualitative and/or Quantitative), and description of the implemented software if used. Refer, but not limited, to the RMP.

4. Key Assumptions - in this section all key assumption needs to be presented in order to help ensure that project leadership and other stakeholders understand the steps, limitations, logics and any decision made in the risk analysis.

5. Risk Analysis Results - in this Section needs to be presented the results in narrative as well as any table, chart and figures obtained from the risk analysis (i.e. Risk Register, Criticality Index, Tornado Charts, Finish Date and cost Histograms and so on).

6. Observation and Recommendations - In this section needs to be presented all the major findings and/or observations captured from the analysis results. This will come along with key recommendations and corrective actions that my assist in mitigating the risk in order to achieve the project's objectives.