

Department of Energy
Oak Ridge Office of Environmental Management
Procedure

RISK MANAGEMENT

OREM-PC-IP-04
Revision 3

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Prepared:



Thomas C. Reed
Planning and Baseline Management Division

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Date

Approved:



Alan G. Stokes, Director
Planning and Baseline Management Division

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Date



EM Environmental Management

safety ✦ performance ✦ cleanup ✦ closure

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Revision Log

Revision	Description of the Revision	Issue Date
0	Initial Issue	May 2011
1	Update Section 4.0 Responsibilities.	July 2013
2	Update to ensure procedure complies with OREM Quality Assurance (QA) Implementation Plan (OREM-OM-PL-04). Update procedure with new numbering system EM-1.6 to OREM-PC-IP-04.	January 2015
3	Update to provide clarification on 50% confidence level (CL) estimate.	June 2015

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List of Acronyms

CL	Confidence level
DOE	United States Department of Energy
IPT	Integrated Project Team
MR	Management Reserve
OREM	Oak Ridge Office of Environmental Management
PBS	Project Baseline Summary
PFPD	Portfolio Federal Project Director
QA	Quality Assurance
QL	Quality Level
RA	Risk Assessment
RMC	Risk Management Coordinator
T&P	Technical and Programmatic
WBS	Work Breakdown Structure

1.0 PURPOSE

This procedure defines the process for assuring that the Oak Ridge Office of Environmental Management (OREM) Program incorporates consistent methods to identify, manage, and mitigate the impact of project-related risks. It is based on United States Department of Energy (DOE) Guide 413.3-7A, *Risk Management Guide*, and covers the process for initiating, planning, executing, monitoring, and closing out risks throughout project life cycles.

2.0 SCOPE

The scope of this procedure is to provide direction for all OREM portfolios for the following:

- Risk Planning
- Risk Assessment
- Risk Handling
- Contingency Analysis
- Risk Monitoring

3.0 REFERENCES AND DEFINITIONS

3.1 Use References

- DOE Guide 413.3-7A, *Risk Management Guidance*
- OREM-QA-IP-05, *Quality Records*
- OREM-QA-IP-03-F-01, *QL-1 OREM Work Activity List*

3.2 Source References

- DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*

3.3 Forms Prescribed

- OREM-PC-IP-04-F-01, *OR Risk/Opportunity Form*

3.4 Definitions

Opportunity – An event with potentially positive cost and/or schedule impact(s) to the project.

Residual Risk – The remaining risk after mitigating actions have been implemented. If there are no mitigating actions for the risk event, the original risk and the residual risk are the same.

Risk – A measure of the potential inability to achieve overall project objectives within defined scope, cost, schedule, and technical constraints. The two components of risk include the likelihood of failing to achieve a particular outcome, and the consequences of failing to achieve that outcome.

Likelihood – A component of risk that describes the probability of failure or success of a particular outcome.

Consequence – The description of the result or impact of failing to achieve success for a particular outcome. Consequences are usually thought of as having only negative effects on an outcome; however, the net effect can be positive opportunities based on cost reductions or efficiencies.

Risk Assessment – The continuous process of identifying risk events, evaluating the events, determining handling strategies to deal with the risk events, tracking and re-evaluating the risk event, and bringing closure to the risk event.

Risk Events – Potential occurrences that are assessed to determine the level of risk, such as things that could go wrong for a project or system. The events should be defined to a level that an individual comprehends potential impacts and causes. For example, a potential risk event for a remediation project could be the discovery of contamination in an area not thought to be contaminated. Events should be selected, examined, and assessed by subject matter experts.

Risk Management – A proactive process that addresses future events and uncertainties, whose exact outcome is unknown, by identifying and examining a range of possible outcomes. In general, outcomes are categorized as favorable or unfavorable, and risk management is the art and science of planning, assessing, and handling future events to increase the potential for favorable outcomes. The alternative to risk management is crisis management, a resource-intensive process that is normally constrained by a restricted set of available options.

Risk Monitoring – Tracking and evaluating risk on a regular basis which includes examining risk reduction until the risk becomes a negligible project concern or has been eliminated.

Risk Planning – The process of developing and documenting an organized, comprehensive, and interactive strategy, as well as methods for identifying and tracking risk areas, developing risk-handling strategies, performing continuous risk assessments (RAs) to determine how risks have changed, and assigning adequate resources.

Risk-handling Strategies – Plans of action developed to deal with particular risk events. The handling strategy can range from monitoring the event without any other action to developing a detailed mitigation work scope to reduce the likelihood of the event occurrence or reduce the impact of a risk event. Not all risks require large mitigation efforts and some risks are unavoidable. The key is to find a handling strategy that is suitable for the risk and not assume the only way to avoid a risk is to mitigate the likelihood of occurrence.

4.0 RESPONSIBILITIES

4.1 Portfolio Federal Project Directors

- 4.1.1 Manages risks and opportunities for their portfolios. Ensures that programmatic and project risks are identified, analyzed, mitigated, tracked, and closed.
- 4.1.2 Develops and maintains Portfolio Risk Management Plans with assistance from the OREM Risk Management Coordinator (RMC). This step creates a Quality Record which shall be processed per Section 7.0.

4.2 OREM Integrated Project Teams

- 4.2.1 Conducts the following risk planning, assessment, handling strategies, and monitoring of risk mitigation activities for assigned projects:
 - Identifies and analyzes risks. Prepares and/or updates the OREM Risk/Opportunity Assessment Form. (See Attachment A). This step creates a Quality Record which shall be processed per Section 7.0. Instructions for completing the Risk/Opportunity Form are shown in Attachment B.
 - Evaluates and recommends risk-handling strategies to the Portfolio Federal Project Directors (PFPDs) including developing specific tasks that will handle the risk.
 - Monitors and reports the effectiveness of the mitigating actions for the risks assigned.

4.3 OREM Risk Management Coordinator

- 4.3.1 Conducts the following coordination activities:
 - Updates this procedure.
 - Provides support to the OREM Integrated Project Teams (IPTs) in implementing this procedure.

- Manages repository for the OREM Risk/Opportunity Forms.
- Provides summary reports of information contained in the OREM Risk/Opportunity Forms.
- Performs the contingency analysis described in Section 5.4.
 - Manages repository for Crystal Ball[®] Risk Analysis Software contingency calculations.
 - Provides summary reports of contingency calculations.
- Assists PFPDs in developing and maintaining Portfolio Risk Management Plans.

5.0 PROCEDURES

5.1 Risk Planning

5.1.1 The following top-down and bottom-up process will be used by the IPT with support from the RMC to develop and/or update the OREM Risk/Opportunity Forms:

- Reviews list of risks provided in Attachment C, *Sample Project Risks*.
- Reviews contractor risks identifying risks that are Federal risks.
- Considers top-down risks that may include generic and strategic risks potentially affecting the entire OREM Program.
- Evaluates baseline assumptions that could present a risk or opportunity to the project.
- Eliminates any duplicate risks.
- Develops statement that provides a clear definition to bind the risk.
- Description should include the conditions or situation that causes the risk.

5.1.2 The OREM Risk/Opportunity Form will include the following information for Federal risks:

- Risk Number as assigned by the RMC.
- Risk Event description.
- Date Identified.
- Project Baseline Summary (PBS) Number.
- Work Breakdown Structure (WBS) or WBSs impacted.
- PFPD and Risk Owner.
- Qualitative Likelihood, Impact, and Risk Level.

5.2 Risk Assessment

- 5.2.1 The IPT, with support from the RMC, is responsible for assessing risk events that could adversely impact the project which includes risk definition, probability/likelihood determination, and an evaluation of impacts/consequences. The RA is documented on the OREM Risk/Opportunity Form.
- 5.2.2 The risk Probability/Likelihood determination should be based on the following ranges:
- Very Unlikely: Probability is remote (0 – 10%).
 - Unlikely: Probability is low (10 – 24%).
 - Likely: Probability is moderate (25 – 74%).
 - Very Likely: Probability is high (75 – 90%).
 - Imminent: Probability is very high (>90%).
- 5.2.3 Impact or Consequences Determination for Risk Occurrence should be based on the following criteria:
- Negligible: Minimal or no consequences in project mission, cost, or schedule performance (impact <0.2%).
 - Marginal: Small reduction in project performance or moderate threat to project mission (impacts between 0.2% and 1%).
 - Significant: Significant degradation in project performance (impact >1% to 3%).
 - Critical: Project objectives cannot be achieved or excessive impact to project cost of schedule (impact >3% to 10%).
 - Crisis: Project objectives cannot be achieved or project mission failure is imminent (impact greater than 10%).
- 5.2.4 The Risk Level Matrix shown in Table 1 is used to categorize each risk.

TABLE 1. RISK LEVEL MATRIX

		Threats				
		Moderate	Moderate	High	High	High
Likelihood of Occurrence	Imminent >90%	Moderate	Moderate	High	High	High
	Very Likely 75% - 90%	Low	Moderate	High	High	High
	Likely 25% - 74%	Low	Moderate	Moderate	High	High
	Unlikely 10% - 24%	Low	Low	Moderate	Moderate	High
	Very Unlikely <10%	Low	Low	Low	Moderate	High
		Negligible <0.2%	Marginal >0.2% - 1%	Significant >1% - 3%	Critical >3% - 10%	Crisis >10%
		Impact of Consequence of Occurrence				

5.3 Risk Handling

- 5.3.1 The IPT should evaluate handling techniques based on feasibility, effectiveness, and cost and schedule implications.
- 5.3.2 The following handling strategy techniques should be evaluated and the results summarized on the OREM Risk/Opportunity Form:
- Accept: Risk cannot be avoided or mitigated.
 - Mitigate: Strategy can be developed to reduce likelihood/consequences.
 - Avoid: Planning can result in an elimination of the risk.
 - Transfer: Risk can be transferred to contractor or DOE Headquarters.
- 5.3.3 If mitigation is the selected risk management strategy, then handling strategy action items should be developed. The Risk Owner has primary responsibility for developing this.

5.4 Contingency Analysis

- 5.4.1 The RMC is responsible for performing a contingency analysis based on the identification and assessment of risk as determined by the IPT and documented on the OREM Risk/Opportunity Assessment Form.

5.4.2 The technical and programmatic contingency will be calculated using Crystal Ball[®] Risk Analysis Software. The primary model inputs are probability of occurrence and a three point estimate developed as part of the analysis of each risk.

5.4.3 The schedule contingency will be calculated using the project schedule and schedule uncertainty ranges.

5.5 Risk Monitoring

5.5.1 Risks and risk mitigation actions should be periodically reviewed and updated by the IPT in accordance with Section 3.0 references. This will be documented on the OREM Risk/Opportunity Form.

6.0 Risk Model Summary

6.1 Introduction

The purpose of this section is to describe how contingency is determined.

A contingency analysis is performed on the life-cycle technical, cost, and schedule baseline to determine the amount of estimate, schedule, and technical and programmatic contingency needed to ensure successful completion of a project. The contingency analyses depend on the identification and assessment of the risks as determined by the IPT and documented on the OREM Risk/Opportunity Form. Management Reserve (MR) and contingency are used to provide resources to deal with the realization of technical and programmatic (T&P) risks and the impacts of schedule and estimate uncertainty. MR covers the scope under contract and is held by the contractor. Contingency is held by DOE and is sometimes referred to as “DOE Contingency.”

6.1.1 Estimate Contingency

Estimate contingency addresses cost estimating uncertainty within the project baseline. Estimate contingency is calculated from a Monte Carlo simulation using Crystal Ball[®] Risk Analysis Software. This software utilizes a probabilistic determination method and yields contingency values at CLs.

6.1.2 Schedule Contingency

Schedule contingency addresses uncertainty within the project schedule baseline. Items addressed are schedule logic, activity durations, resource availability, planned work processes and schedule impact from T&P RA identified risks. Contingency activities are added to milestones at the end of the project to allow for risk impacts that would extend the completion date by the impacted duration.

6.1.3 Technical and Programmatic Risk Assessment Contingency

T&P RA contingency addresses uncertainty associated with specific project risks. It is based on the residual risk impacts identified by the team during the RA phase. The IPT develops residual probability and best, most likely, and worst case impact cost estimates during the assessment for each discrete risk. A cost probability distribution is developed for each risk using Crystal Ball[®] Risk Analysis Software. The software is then used to statistically combine the distributions through a Monte Carlo process to produce the T&P RA Contingency estimate.

6.2 Determining Project Cost Range

The risks for a project are determined and analyzed at 50%, 80%, and sometimes higher % CLs. Typically, the CLs of 50% and 80% are used by the IPT to determine the cost range for a project. However, if a project is early in its maturity, the PFPD may determine that presenting the cost range at a higher level would be more appropriate, especially for capital projects prior to and including the Critical Decision 1 phase. The MR and Contingency would be calculated as follows from the project's escalated point estimate:

- Unescalated Point Estimate: Point Estimate without MR and DOE Contingency.
- 50% CL estimate: Point estimate plus MR and DOE Contingency at 50% CL.
- 80% CL estimate: Point estimate plus MR and DOE Contingency at 80% CL.
- Higher CL estimate: Point estimate plus MR and DOE Contingency at higher CL.

6.3 Contracted Versus Non-contracted Scope

The entire scope of a sub-PBS may not be under contract. In this case, DOE calculates both the MR and contingency. For scope that is under contract, the contractor calculates the MR and DOE calculates the contingency.

7.0 RECORDS

The following Records are generated during the performance of this procedure:

Record Description (section)	Record Type (QL-1, QL-2, N/A)*	Form Number (if applicable)	Record Owner
OREM Risk/Opportunity Form (4.2.1)	QL-2	OREM-PC-IP-04-F-01	RMC
Portfolio Risk Management Plans (4.1.2)	QL-2	N/A	PFPD

* QA records for Quality Level (QL)-1 activities shall be processed and submitted per OREM-QA-IP-05, *Quality Records*. OREM-QA-IP-03-F-01, *QL-1 OREM Work Activity List*, contains a listing of OREM QL-1 Activities.

Non QA records and QL-2 Activities Records shall be processed as a Federal Record and submitted following the Office of Science Management System Description Records Management System procedures.

8.0 ATTACHMENTS

Attachment A – OREM Risk/Opportunity Form

Attachment B – Guide for Completing Risk/Opportunity Assessment Form

Attachment C – Sample Project Risks

ATTACHMENT A – OREM RISK/OPPORTUNITY FORM

Risk/Opportunity Assessment Form			
ID Number:	Revision:	Last Date Evaluated:	Status: Active
Event Title:			
Type: Risk		Category:	
Assess Element:	Title:		
Responsible Org:		Contact:	Date Identified:
Statement of Event:			
Likelihood:		Basis:	
Consequence / Benefit:		Basis:	
Most Significant Cost Impact (\$K):		Most Significant Schedule Impact:	
Level:		Event Trigger:	
Handling Strategy:		Description:	
Handling Strategy Action Items:			
HS Implementation Cost (\$K):		Basis:	
HS Implementation Schedule:		Basis:	
Other Handling Strategies:			
Statement of Residual Risk:			
Residual Likelihood:		Basis:	
Residual Consequence:		Basis:	
Residual Risk Level:		Residual Impact Basis:	
Residual Cost Impact (\$K):	<u>Best Case</u>	<u>Most Likely</u>	<u>Worst Case</u>
Residual Schedule Impact:			
Impacted Scope of Work:			
Evaluation Comments:			
Event Comments:			

ATTACHMENT B – GUIDE FOR COMPLETING RISK/OPPORTUNITY ASSESSMENT FORM

DATA TITLE	DATA INPUT
Assess Element	Subproject WBS level, if more than one subproject per sub-PBS.
Category	Not used, leave blank.
Consequence/Benefit	“Negligible” or “Marginal” or “Significant” or “Critical” or “Crisis” (see Table 2).
Consequence/Benefit Basis	Rationale on which the determination for the consequence was made.
Contact	Contact person for risk event (person with knowledge of risk event data).
Date Identified	Date when the original risk was identified.
Description	Provide a brief description of the mitigation strategy.
Evaluation Comments	Provide any comments related to the periodic evaluation of the risk and documentation of changes made to the risk from the prior version.
Event Comments	Insert any comments or clarifications here. Also can insert additional information on the risk cost/schedule basis determination.
Event Title	Short, summary title for risk event.
Event Trigger	Brief statement of what triggers the risk event to occur.
Handling Strategy	Accept/Monitor, Mitigate, or Avoid/Eliminate.
Handling Strategy Action Items	Identify action item(s) required to implement the mitigation strategy, if any.
HS Implementation Cost (\$K)	Provide cost of implementing strategy, if applicable.
HS Implementation Cost Basis	Provide basis of the cost for the implementing strategy, if applicable.
HS Implementation Schedule	Provide schedule of implementing strategy, if applicable.
HS Implementation Schedule Basis	Provide basis of the schedule for the implementing strategy, if applicable.
ID Number	Risk Number – assigned by Risk Database.
Impacted Scope of Work	List impacted work scope if not previously identified.
Last Date Evaluated	Date of last risk evaluation/revision.
Level	From <u>Risk Level Matrix (Figure 2)</u> – determined from Likelihood and Consequence – automatically populated in Risk Database.

DATA TITLE	DATA INPUT
Likelihood	“Imminent,” “Very Likely,” “Likely,” “Unlikely,” or “Very Unlikely” (see Table 1).
Likelihood Basis	Rationale on which the determination for the likelihood was made.
Most Significant Cost Impact	Worst Case – amount of effected project cost – provide a basis for estimation of the cost impact. If the risk represents an opportunity (cost savings), the cost impact should be shown as a negative value.
Most Significant Schedule Impact	Worst Case – Months of project delay – provide a basis for estimation of the schedule delay. If the risk represents an opportunity (schedule improvement), the schedule impact should be shown as a negative value.
Other Handling Strategies	Identification of any other handling strategies that may be employed to minimize the original risk.
Revision	Revision number (provides document control), sequential number assigned by the RMC or designee.
Residual Cost Impact (\$K) – Best Case	Best Case – amount of affected project cost. If the risk represents an opportunity (cost savings), the cost impact should be shown as a negative value.
Residual Cost Impact (\$K) – Most Likely	Most Likely Case – amount of affected project cost. If the risk represents an opportunity (cost savings), the cost impact should be shown as a negative value.
Residual Cost Impact (\$K) – Worst Case	Worst Case – amount of affected project cost. If the risk represents an opportunity (cost savings), the cost impact should be shown as a negative value.
Residual Consequence	“Negligible” or “Marginal” or “Significant” or “Critical” or “Crisis” (see Table 2) of the remaining residual risk.
Residual Consequence Basis	Rationale on which the determination for the consequence on the residual risk was made.
Residual Likelihood	“Imminent,” “Very Likely,” “Likely,” “Unlikely,” or “Very Unlikely” (see Table 1) for the remaining residual risk.
Residual Likelihood Basis	Rationale on which the determination for the likelihood on the residual risk was made.
Residual Impact Basis	The basis on which the cost for the “best,” “most likely,” and worst case cost and schedule impacts are determined.
Residual Risk Level	From Risk Level Matrix (Figure 2) – determined from the residual Likelihood and Consequence – automatically populated in Risk Database.
Residual Schedule Impact – Best Case	Best Case – months of project delay. If the risk represents an opportunity (schedule improvement), the schedule impact should be shown as a negative value.
Residual Schedule Impact – Most Likely	Most Likely Case – months of project delay. If the risk represents an opportunity (schedule improvement), the schedule impact should be shown as a negative value.

DATA TITLE	DATA INPUT
Residual Schedule Impact – Worst Case	Worst Case – months of project delay. If the risk represents an opportunity (schedule improvement), the schedule impact should be shown as a negative value.
Responsible Org	DOE or contractor.
Statement of Event	Detailed statement of risk event (includes explanation of why risk event might occur, what organizations are involved, etc.).
Statement of Residual Risk	Same as original risk if handling strategy is Accept/Monitor. Should have a reduced Likelihood and/or consequence if a mitigation strategy is utilized. Risk Level may change (check Risk Level Matrix).
Status	Active or Closed Risk Event.
Title	Subproject Title, if more than one subproject per sub-PBS.
Type	Risk type – internal or external risk to the project and technical or programmatic risk.

ATTACHMENT C – SAMPLE RISKS

Technical Risks

- Insufficient design details.
- Incomplete facility or site characterization.
- Inadequate assumptions on technical basis for work.
- Treatment technologies not proven.
- Safety basis documentation not well defined.

External Risks

- Priority changes that impact funding.
- Local communities raise objections.
- Political factors change.
- New stakeholders emerge with new needs.
- Change in national security requirements.
- Project execution dependent on other sites (disposal facilities).

Environmental Risks

- Permit actions take longer than expected.
- Comprehensive Environmental Response, Compensation, and Liability Act approval delayed.
- Environmental regulations change.
- Historic preservation requirements change.

Internal Risks

- Insufficient or inexperienced staff.
- Losing critical staff.
- Internal approval result in project delays.
- Functional support organization cannot support schedule.
- Contract rebid results in transition period.

Project Risks

- Project scope poorly defined.
- Project cost estimate and schedule lacks detail.
- Unanticipated scope added to project.
- Pressure to deliver project on an accelerated schedule.
- Conflicting requirements for funds and staffing.