

# INTRODUCTION TO MDT'S RISK MANAGEMENT PROCESS

## COST ESTIMATING BASICS

Determine project needs/scope

Identify project characteristics

- Location

- Type

- Complexity

Determine estimate basis

Prepare base estimate

- Don't include risk

Determine risk/contingency

Review and approve estimate

Communicate estimate

- Scope

- Assumptions

- Basis

## RISK IDENTIFICATION AND ANALYSIS

Plan

Identify

Analyze

## RISK MANAGEMENT

Respond

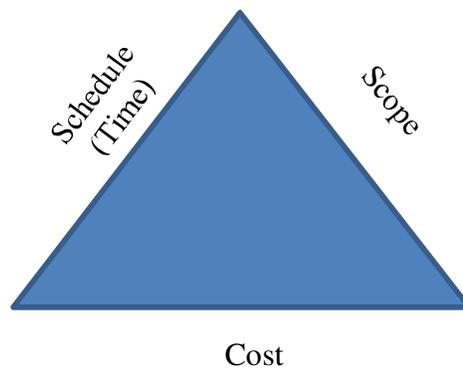
Monitor and control

Communicate

## DOCUMENTATION

Risk Management Plan

Project Reports



## RISK-BASED COST ESTIMATING

Determine project needs/scope

- Key requirements
- Contextual needs
- Enhancements

Identify project characteristics

Location

- Start/end points
- Terrain
- Route classification
- Urban/rural
- Indian Reservation
- Limitations/constraints

Type

Reconstruction/Rehabilitation/Preservation/Safety/Bridge

Complexity

High/Medium/Low

Determine estimate basis

- Project description including requirements
- Schematic or sketches
- Key dimensional information

Prepare base estimate

- Don't include risk
- Include estimates for big ticket items (Table 1.)

Guardrail	Traffic signals, lighting, ITS items
Large culverts, irrigation facilities	Turn bays, other isolated widening
Storm drain	Pavement markings, signing
ADA ramps, curb and gutter, sidewalk work	Wetland mitigation, wildlife crossings, wildlife fencing, etc.
Bridge work	Unique or unusual fencing needs
Bridge survey	Constructability issues
Bridge adoption	Public relations (especially urban jobs)
Retaining structures	Training program
Contaminated soil removal/disposal	Noxious weed control
Railroad involvement	Extensive utility work-arounds (urban)

*Table 1. Additional Items*

Determine risk/contingency – Risk-based cost estimating

## RISK IDENTIFICATION AND ANALYSIS

### Plan

- Determine the appropriate level of project risk management (see H. Wynnlee Crisp matrix, Figure 1.)
- Include time in schedule for risk management
- Include costs in preliminary engineering estimate
- Include appropriate costs in construction estimate
- Remember triangle: Schedule/Scope/Budget or Time/Scope/Cost
- Develop risk management mindset

### Identify

- Focus on those risks that could significantly affect project objectives (Table 2.)

Schedule time (extra cost for expedited work, timing restrictions, time of year, A+B bids)	Traffic control issues
Project setting – remoteness, urban setting, tight constraints, Reservation	Railroad, utility issues
Availability of materials	Environmental issues and/or mitigation needs
Availability of contractors	Geotechnical issues
Project size	Potential for poor soil conditions
	Unknown risks/potential change orders

*Table 2. Contingency and Risk Factors*

- Opportunities and threats
- Brainstorm and condense
- Use risk element chart (Figure 2.)
- Get input from local experts

### Analyze individual risks

- Qualitative or quantitative
- Probability of occurrence
- Cost impacts
- Schedule impacts
- Opportunities (decrease cost or time)
- Threats (increase cost or time)
- Overall significance (Risk Impact Matrix – Figure 3.)

## RISK MANAGEMENT

### Respond

- Develop strategies
- Avoid or Exploit (may need to adjust scope, schedule, or budget)
- Mitigate or Enhance (may need to add PE and/or tasks to schedule)
- Accept (add or remove contingency or adjust costs/schedule)
- Assign task to responsible party with deadlines

## Monitor and control

- Follow through on strategies
- Retire risks that have been taken care of
- Determine if additional risks have surfaced
- Revise risk management plan as needed

## Communicate

- Add risk impact to cost and schedule estimates (can be range or contingency (Figure 4))
- Keep all stakeholders informed of status
- Reconvene risk management team if necessary
- Communicate positive and negative changes

## **DOCUMENTATION**

### Risk Management Plan

#### Project reports

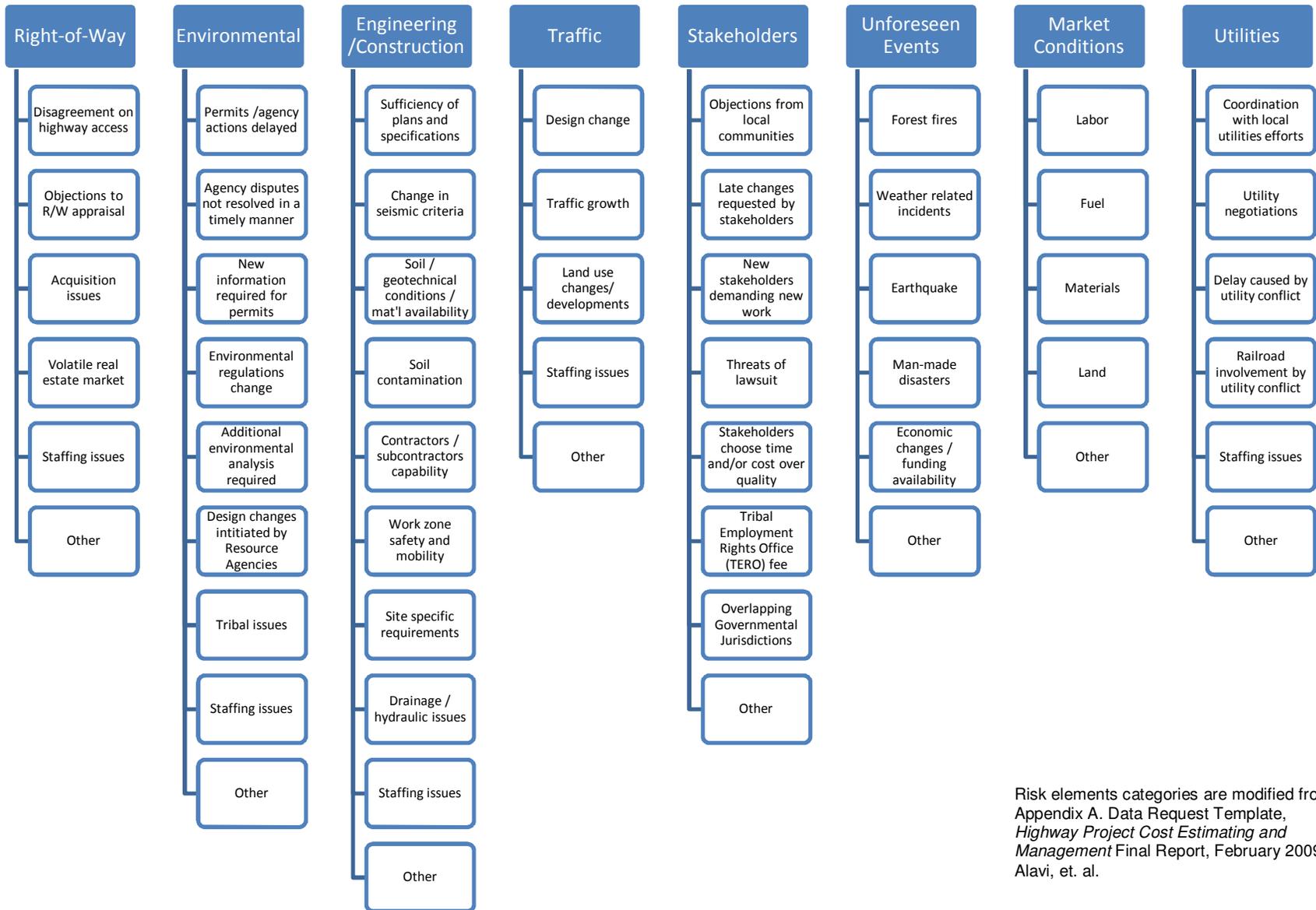
- Scope
- Assumptions
- Basis

## DECIDING THE APPROPRIATE LEVEL OF PROJECT RISK MANAGEMENT

Every project management process and tool takes time and effort. The question is always how much effort is justified by the project and the situation. For risk management, this decision revolves around how important it is to meet one or more project objectives. The more important it is to keep a project under control, the more robust the risk management process needs to be. While ignoring management of project risks is not a viable option in any situation, the depth of effort and detail depends on the unique circumstances of each particular project.

	<b>VERY LOW</b>	<b>LOW</b>	<b>MEDIUM</b>	<b>HIGH</b>	<b>VERY HIGH</b>												
	Not important	Nice to achieve; but not critical	Consequences of failure are low to mod.	Consequences of failure significant	Critical; failure isn't an option												
<b>How important is it to</b>	(circle your rating)																
Complete on budget	1	10	25	50	100												
Complete on schedule	1	10	25	50	100												
Fulfill all the requirements of the scope	1	10	25	50	100												
Meet the quality expectation	1	10	25	50	100												
Have a fully functional finished product	1	10	25	50	100												
Have a satisfied Owner	1	10	25	50	100												
Know if a "high" risk is unreasonably high	1	10	25	50	100												
Understand the probability of completing on schedule	1	10	25	50	100												
Understand the probability of completing on budget	1	10	25	50	100												
Know which tasks impose the greatest risk on the overall project	1	10	25	50	100												
Communicate the probability of success/failure to others	1	10	25	50	100												
Demonstrate that a tight schedule is actually inadequate	1	10	25	50	100												
Demonstrate that a tight budget is actually inadequate	1	10	25	50	100												
Avoid damaging your reputation	1	10	25	50	100												
Avoid damaging your <i>organization's</i> reputation	1	10	25	50	100												
<b>TOTAL RATING</b>																	
<h3 style="margin: 0;">Level of Project Risk Management</h3> <table style="width: 100%; border: none;"> <tr> <td style="width: 15%; vertical-align: top;"><b>0 – 15</b></td> <td>Risk Management not required. The most basic project control techniques are adequate.</td> </tr> <tr> <td style="vertical-align: top;"><b>16 – 150</b></td> <td>Minimal effort to manage risks is warranted. Project Manager should think about what might go wrong and how to avoid the consequences, devising a response for the high probability and high severity risks.</td> </tr> <tr> <td style="vertical-align: top;"><b>151 – 375</b></td> <td>A small team of knowledgeable individuals, including the Project Manager, should implement all of the Risk Management processes. Rely on Qualitative analysis.</td> </tr> <tr> <td style="vertical-align: top;"><b>376 – 750</b></td> <td>Implement all of the Risk Management processes. Use a team that is well qualified in each key area of risk or technology. Update the risk analysis periodically and each time there is a fundamental project change. Elevate the importance of managing risks in accordance with the plan in the minds of team members. Consider using Quantitative Analysis.</td> </tr> <tr> <td style="vertical-align: top;"><b>751 -950</b></td> <td>In-depth Risk Management is needed using robust processes. High level of effort is justified. Quantitative analysis is recommended.</td> </tr> <tr> <td style="vertical-align: top;"><b>&gt;950</b></td> <td>Same as 751-950, except that Quantitative analysis is required.</td> </tr> </table>						<b>0 – 15</b>	Risk Management not required. The most basic project control techniques are adequate.	<b>16 – 150</b>	Minimal effort to manage risks is warranted. Project Manager should think about what might go wrong and how to avoid the consequences, devising a response for the high probability and high severity risks.	<b>151 – 375</b>	A small team of knowledgeable individuals, including the Project Manager, should implement all of the Risk Management processes. Rely on Qualitative analysis.	<b>376 – 750</b>	Implement all of the Risk Management processes. Use a team that is well qualified in each key area of risk or technology. Update the risk analysis periodically and each time there is a fundamental project change. Elevate the importance of managing risks in accordance with the plan in the minds of team members. Consider using Quantitative Analysis.	<b>751 -950</b>	In-depth Risk Management is needed using robust processes. High level of effort is justified. Quantitative analysis is recommended.	<b>&gt;950</b>	Same as 751-950, except that Quantitative analysis is required.
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**H. Wynnlee Crisp Matrix**  
**Figure 1**

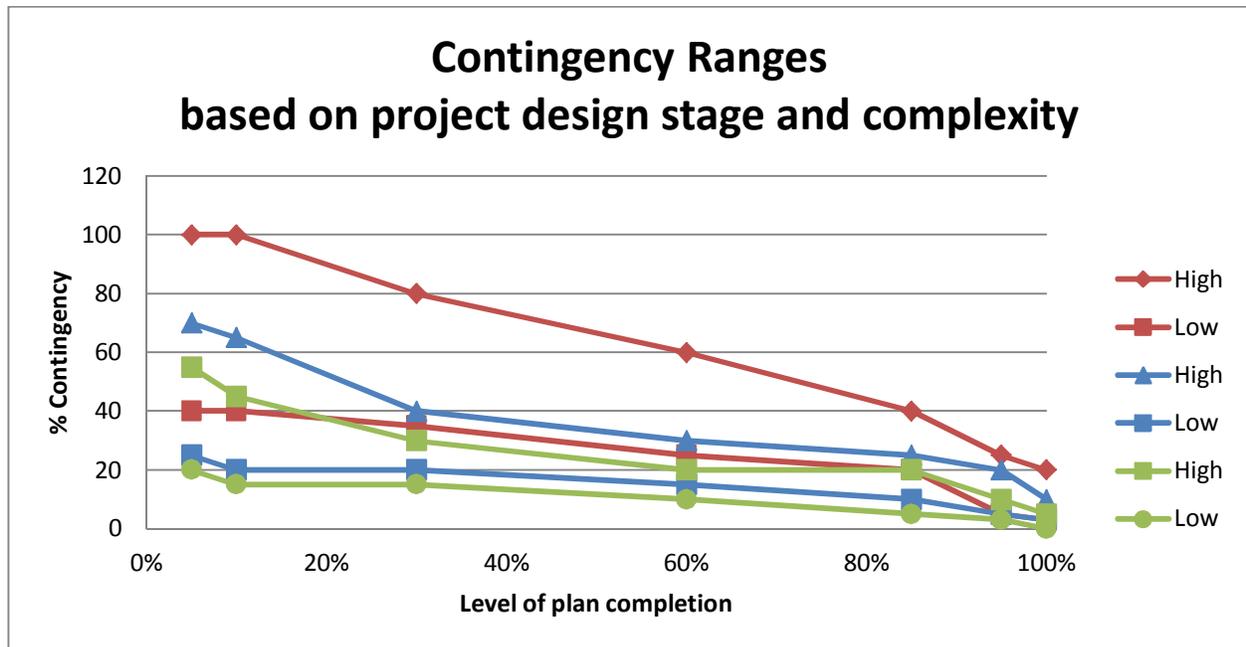


Risk elements categories are modified from Appendix A. Data Request Template, *Highway Project Cost Estimating and Management* Final Report, February 2009, Alavi, et. al.

**Risk Element Categories**  
**Figure 2**

<b>Probability of Occurrence</b>	<b>Very High</b>					
	<b>High</b>					
	<b>Medium</b>					
	<b>Low</b>					
	<b>Very Low</b>					
		<b>Very Low</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Very High</b>
<b>Potential Impact</b>						

**Risk Impact Matrix  
Figure 3**



		% Contingency Range by Project Complexity (Low Risk to High Risk)		
		Major Project/ High Complexity	Rehab. or Reconstr. Project Moderate Complexity	Minor Project/ Low Complexity
Project Stage	% Plan Completion	% Contingency	% Contingency	% Contingency
Planning	0-5%	40 - 100	25 - 70	20 - 55
PFR	0-15%	40 - 100	20 - 65	15 - 45
AGR	10-40%	35 - 80	20 - 40	15 - 30
SOW	30-70%	25 - 60	15 - 30	10 - 20
PIH	60-90%	20 - 40	10 - 25	5 - 20
FPR	85-100%	5 - 25	5 - 20	3 - 10
Construction	(Misc. work)	3 - 20	3 - 10	0 - 5

**Contingency Assignments  
Figure 4**