Colorado DOT

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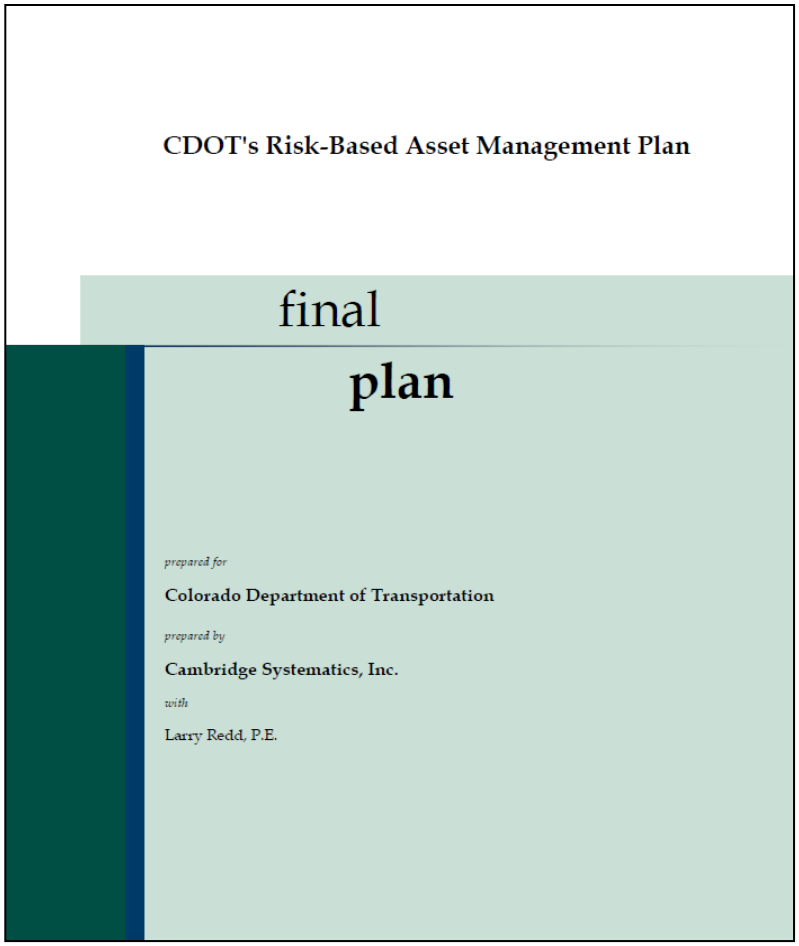
Peer Exchange - Integrating Risk Management in Transportation Asset Management Programs

CDOT's RB AMP and Risk Approach

August 2015

Risk-Based Asset Management Plan (RB-AMP)



RB AMP Content:

- Executive Summary
- 1: Introduction
- 2: Value to Citizens
- 3: Asset Inventory and Condition
- 4: Asset Management Performance Measures and Targets
- 5: Current Asset Management Processes
- 6: Life-Cycle Cost Considerations
- 7: Incorporating Risk into the Asset Management Program
- 8: Financial Plan
- 9: Investment Strategies
- 10: Asset Management Gap Assessment
- 11: Asset Management Implementation Plan
- 12: RB AMP Governance
- Appendices

Assets Included: Pavement, Structures, Culverts, MLOS, Buildings, ITS Equipment, Roadway Equipment, Tunnels, and Rockfall Mitigation Sites

Definition of Risk

Probability (likelihood) x Consequence

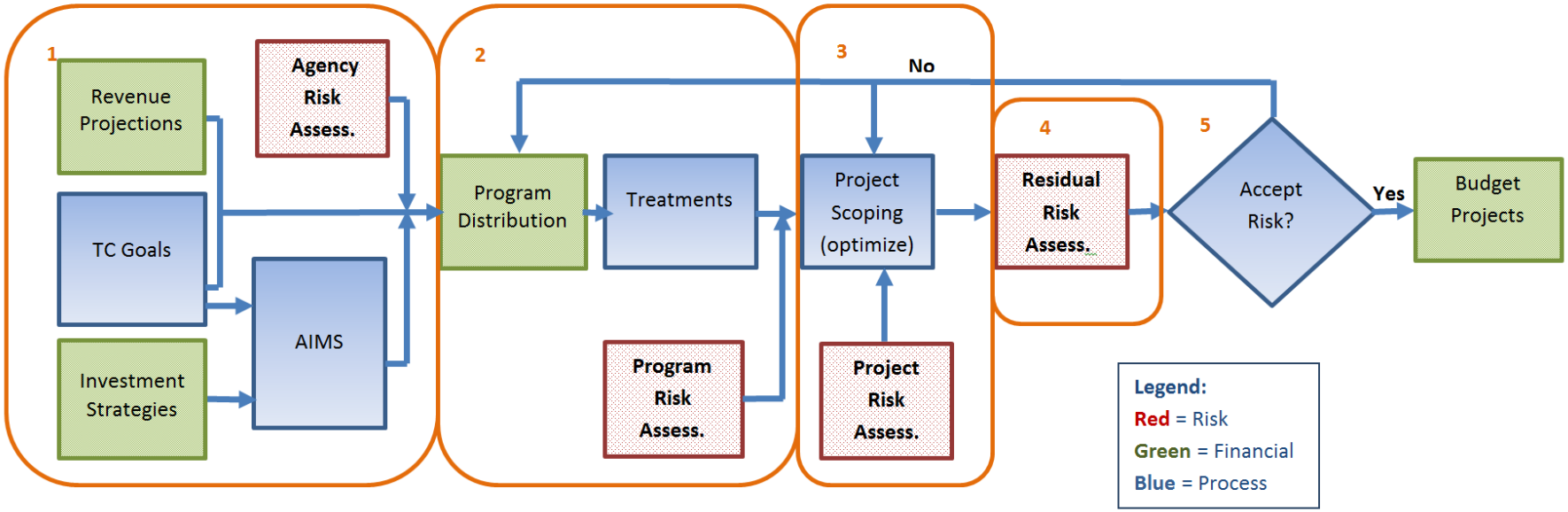
Proposed Approach to Risk

CDOT has defined key cornerstones for considering risk as an integral part of its asset management program. These include:

- An approach to managing risk across various levels
- The development of a risk register
- A comprehensive decision-making process – including GIS

Proposed Approach to Risk

RB-AMP Figure 11.6 Risk Based Asset Management Decision Process



Risk Rating Scale

RB-AMP Figure 7.1 Risk Rating Scale

		Consequence (Level/Descriptor)				
Likelihood		1	2	3	4	5
Level	Descriptor	Negligible	Minor	Major	Critical	Catastrophic
1	Low	1	2	3	4	5
2	Medium Low	2	4	6	8	10
3	Medium	3	6	9	12	15
4	Medium High	4	8	12	16	20
5	High*	5	10	15	20	25

How to Improve

1. Develop a robust risk register that is aligned with your approach
2. Identify locations with greatest risks
3. Develop performance measures and targets
4. Focus investment
5. Develop process

Risk Register

Risk Score	Risk Management Strategy (Treat, Tolerate, Transfer, Terminate)	Benefit in % Risk Score Reduction	Annual Cost of Strategy – $mm	Owner (Identified for Agency Level Risks and Top 50 Risk Scores)
24.0	Treat - determine risk and resilience strategy and organizational structure and communication plans to support future events	5.0%	0.50	Dir of Office of Emerg Mgmt for response; multiple CDOT roles working on strategy
19.5	Tolerate - if we don't have funding to meet targets, we can only tolerate	0.0%	0.0	TC decision if CDOT does this
19.5	Treat - move funding from capacity projects or other assets or programs to meet these targets	50.0%	400.0	TC decision if CDOT does this

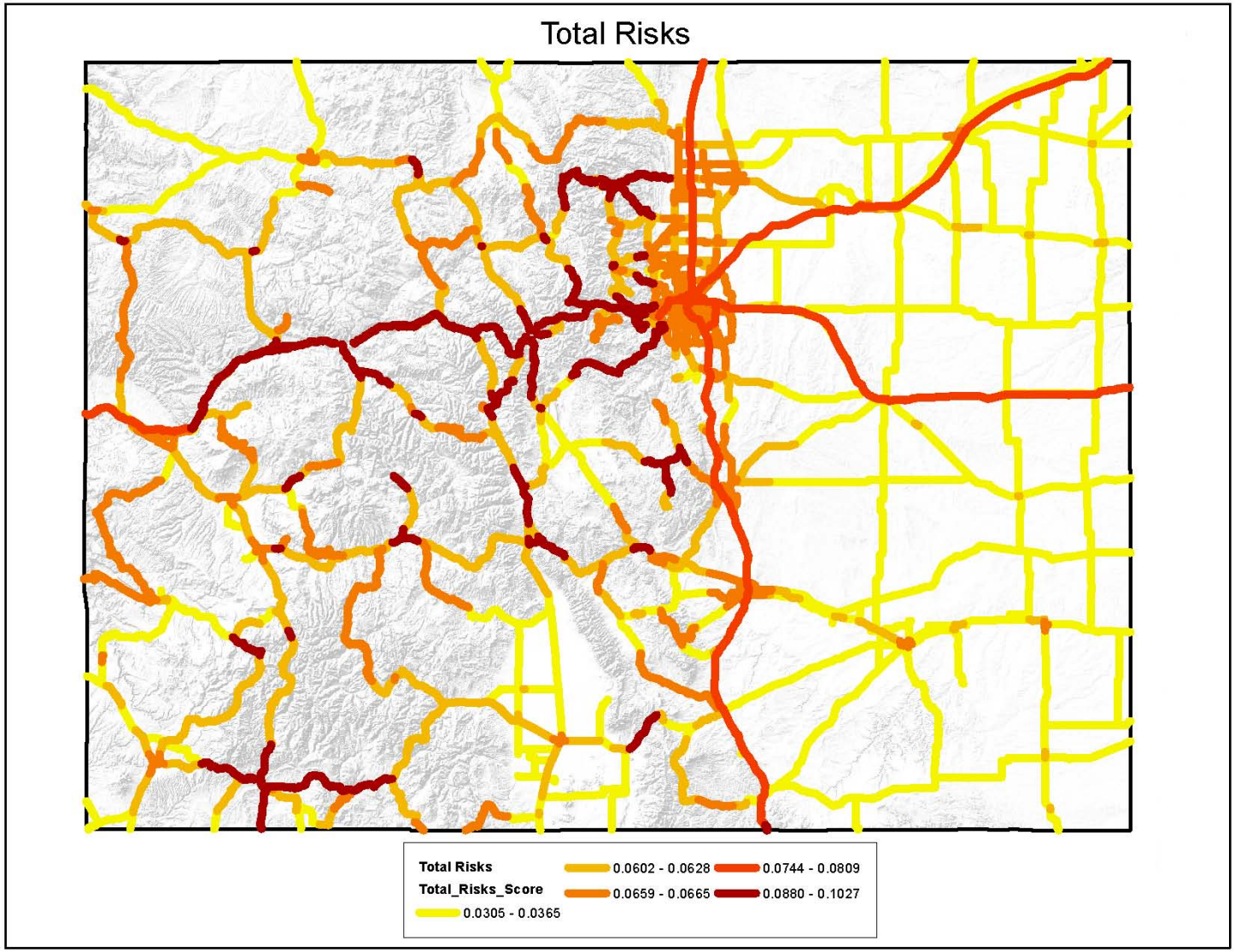
				Consequence Score				Other Considerations									
Risk Level	Asset Class	Event/Occurrence	Likelihood	Safety	Mobility	Asset Damage	Other Financial Impact	Funding	Insurance	Regulatory	Political	Reputation	Risk Score	Risk Management Strategy (Treat, Tolerate, Transfer, Terminate)	Benefit in % Risk Score Reduction	Annual Cost of Strategy – $mm	Owner (Identified for Agency Level Risks and Top 50 Risk Scores)
Project	All	Flooding (or any inclement weather event) (resulting in long term impacts -- damage to assets, requiring replacement)	4	5	5	5	5	x	x		x	x	24.0	Treat - determine risk and resilience strategy and organizational structure and communication plans to support future events	5.0%	0.50	Dir of Office of Emerg Mgmt for response; multiple CDOT roles working on strategy
Agency	All	With limited and variable funding CDOT may not be able to meet CDOT established targets in the desired timeframe	5	3	4	4	2	x		x	x	x	19.5	Tolerate - if we don't have funding to meet targets, we can only tolerate	0.0%	0.0	TC decision if CDOT does this
Agency	All	Are the targets the right targets, and are the targets set by FHWA	5	3	4	4	2	x		x	x	x	19.5	Treat - move funding from capacity projects or other assets or programs to meet these targets	50.0%	400.0	TC decision if CDOT does this
Agency	All	Reprioritization among programs	3	3	3	3	3	x			x	x	10.4	Tolerate	0.0%	0.0	Exec Dir or Gov or TC
Agency	All	Investment does not result in anticipated performance over time	2	2	2	2	2	x			x	x	4.6	Treat - actively evaluate investment and results over time and identify early warning signs that performance is appearing to be less than expected	50.0%	0.2	Asset Managers
Agency	All	Local control of off system NHS segments (10% of the system), however CDOT is responsible for the meeting the overall statewide performance target for the system	1	3	2	3	2	x		x	x	x	3.0	Treat by putting more of our money into our pavement and bridges to get the overall condition higher	40.0%	24.0	TC decision

Risk Score = Ps x Os x [(Ss + Ms + Ds + Fs) / 4]

where

Ps = Likelihood Value
Os = Other Considerations Value = 1 + (0.05 x [Number of Other Considerations Checked]
Ss = Safety Value
Ms = Mobility Value
Ds = Damage (Asset) Value
Fs = Financial Value

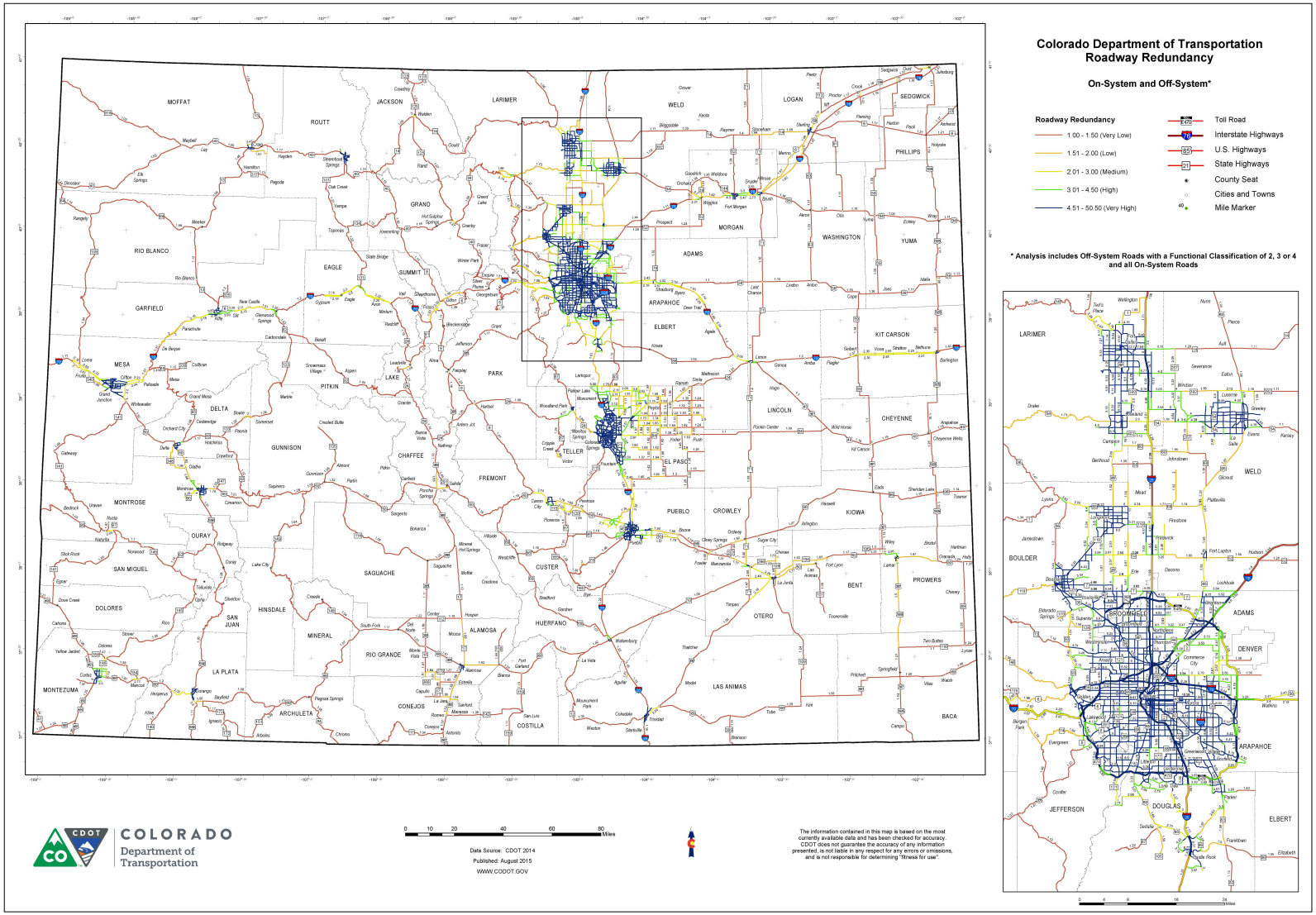
Risk Corridor Archetypes



Performance Measures

Asset	Measure	Current Performance	Fiscally Constrained Target	Aspirational Target
Bridges	Percentage of deck area on structurally deficient CDOT-owned bridges	6%	10% [a]	5%
	Percentage of deck area on structurally deficient bridges on the NHS	5%	10% [a]	5%
	Percentage of CDOT-owned bridges over waterways that are scour critical	7.1%	5%	1%
	Percentage of bridge crossings over Interstates, U.S. routes and Colorado state highways with a vertical clearance less than the statutory maximum vehicle height of 14 feet-6 inches	0.4%	0.4%	0%
	Percentage of bridge crossings over Interstates, U.S. Routes and Colorado state highways with a vertical clearance less than the minimum design requirement of 16 feet-6 inches	4.8%	4.8%	2%
	Percentage of CDOT-owned bridges posted for load	0.1%	0%	0%
	Percentage of CDOT-owned bridges with a load restriction	2.6%	3%	1%
	Percentage of leaking expansion joint by length on CDOT-owned bridges	18.8%	15%	5%
	Percentage of CDOT-owned bridge deck area that is unsealed or otherwise unprotected	31%	30%	5%
Pavement	Percentage high-moderate drivability life for Interstates based on condition standards and treatments set for traffic volume categories	89%	80% [a]	90%
	Percentage high-moderate drivability life for CDOT-owned NHS, excluding Interstates based on condition standards and treatments set for traffic volume categories	78%	80% [a]	90%
	Percentage high-moderate drivability life for the State highway system based on condition standards and treatments set for traffic volume categories	73%	80% [a]	90%
Maintenance	Statewide Letter Grade	B-	B- [a]	B
Buildings	Statewide Letter Grade	86% C or Better	90% C or Better	100% C or Better
ITS	Average Percent Useful Life	126%	90%	85%
Fleet	Average Percent Useful Life	103%	70%	50%
Culverts [f]	Percentage Critical Culverts	2.9%	5%	2%
Geohazards	Number of Sites with letter grade C or better	47% [b]	60% [b]	90% [bd]
Tunnels	Key components of fire/life safety must not exceed 100% of useful life, based on manufacturer's specification, condition inspections and maintenance history.	TBD [c]	100%	100%
Traffic Signals [g]	Percent intersections with at least one component beyond 100% Useful Life	52%	15%	0%
Walls [e]	Percentage of CDOT-owned walls, by square foot, that are in condition state 3 or 4 (poor or severe).	1%	1%	0.5%

Redundant Corridors



Draft Risk Work Flow

Risk Register Results

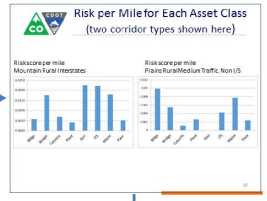
- Corridor/System Risks (w/geographic elements)
- Agency Risks (non-geog.)
- Program-level Risks
- Project Delivery Risks

Programmatic, Systemic (e.g. chronic delays, splits, overruns)

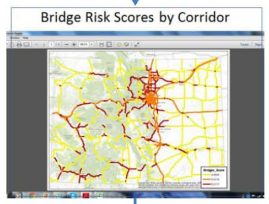
Project-Specific

Corridor Types In Colorado

Understanding Risk By Location

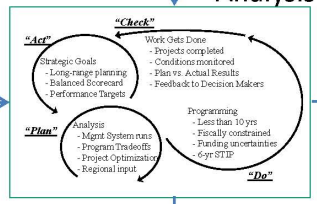


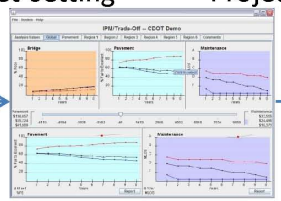
Risk Scores By Location and Asset Class



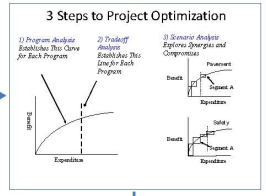
Performance risks -- revenue and/or cost uncertainties, performance modeling, process control issues, forecasting issues, etc.

Plan vs. Actuals, Gap Analysis -- Target-setting



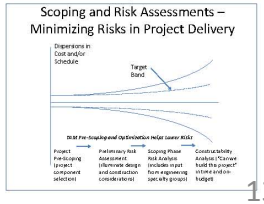


AIMS Output and Project Formulation



"Other Fixes" (better Modeling, Revenue & Project Cost Forecasts, "pipeline loading", etc.)

Project Development



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