COLORADO
Transportation Commission

4201 East Arkansas Avenue, Room270
Denver, CO 80222-3406

DATE: January 21, 2015
TO: Transportation Commission
FROM: Joshua Laipply, Chief Engineer
SUBJECT: Innovative Contracting Update

Purpose
The purpose of this workshop is to update the Transportation Commission on current Innovative Contracting practices within CDOT and Nationally.

Background
CDOT has increased the use of innovative contracting procedures such as Design-Build and CMGC In recent years. Concerns have been expressed by the Transportion Commission as well as the contractor industry in Colorado regarding the equity and appropriateness of using Innovative Contracting methods to deliver construction projects for CDOT. Because of these concerns, staff has compared current CDOT procedures to industry best practices which will be summarized for the Transportation Commission.

Details
To address industry best practices on a national level, staff has contacted Dr. Douglas Gransberg, a nationally renowned expert on inovative project delivery for transportation projects. Dr. Gransberg will summarize national trends as well as the benefits that other states have experienceed with innovative contracting delivery methods.

Craig Actis with the Federal Highway Administration will also provide an overview on the benefits of cost estimating risk.

The Chief Engineer, Joshua Laipply will conclude with an overview of CDOT's experience with Design-Build and CMGC projects, and improving cost estimating practices in Colorado.

Attachments
Innovative Contracting PowerPoint Presentation

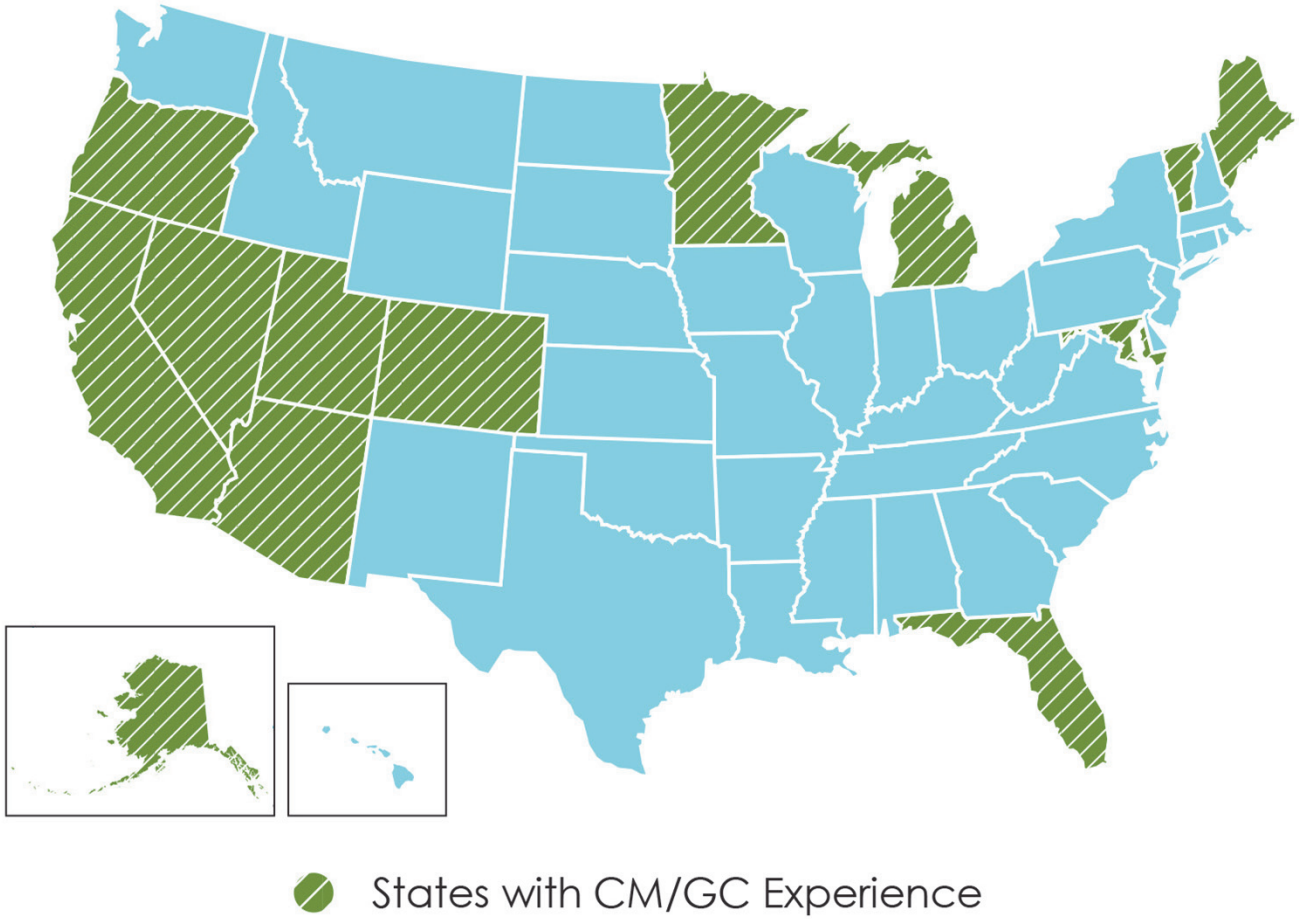
Innovative Contracting at CDOT

January 21, 2015

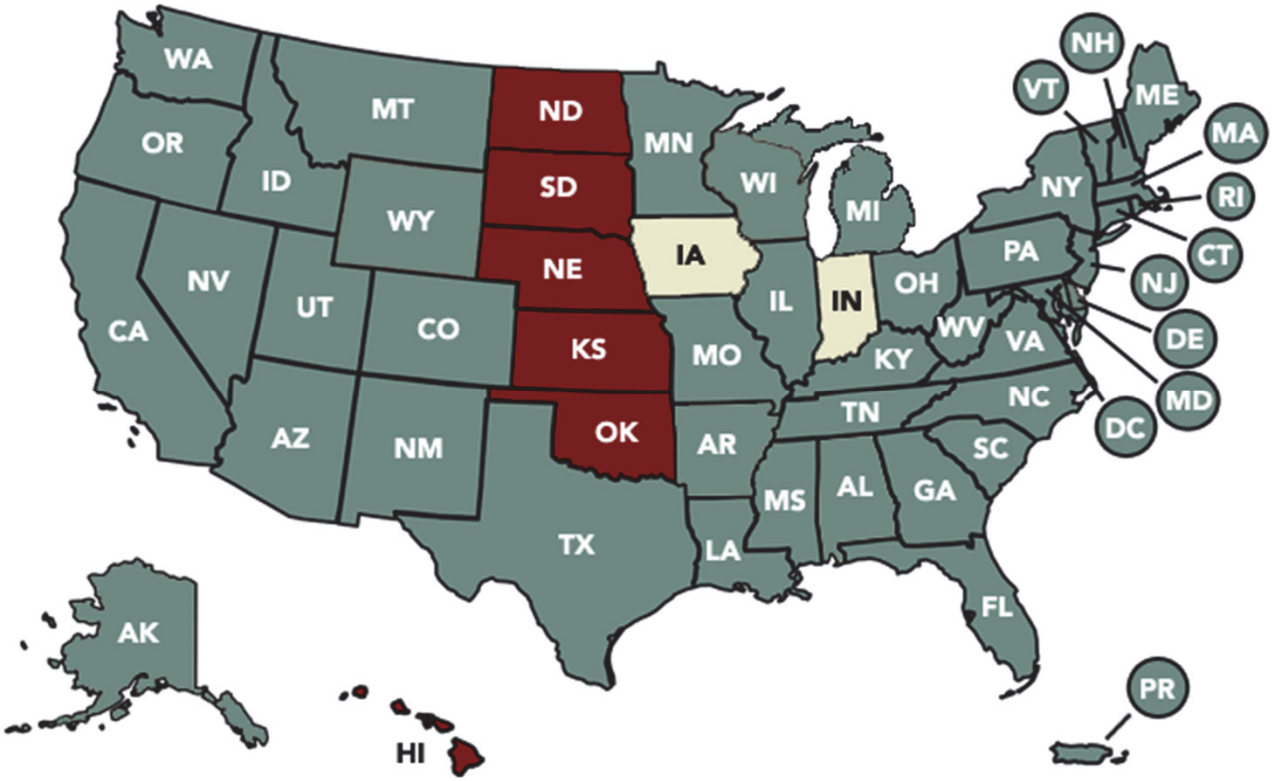
Design-Build and CMGC Nationwide	-	Dr. Douglas Gransberg, P.E., PhD, Gransberg & Associates
Transportation Cost Estimating/Risks Assessment	-	Craig Actis, P.E., FHWA
CDOT Overview and Summary	-	Josh Laipply, P.E., CDOT Chief Engineer

State of the Practice

States using CMGC to Deliver Projects



2013 Nationwide Design-Build Usage



Map Legend

Green	Yes
Red	No
Tan	Not Definitive

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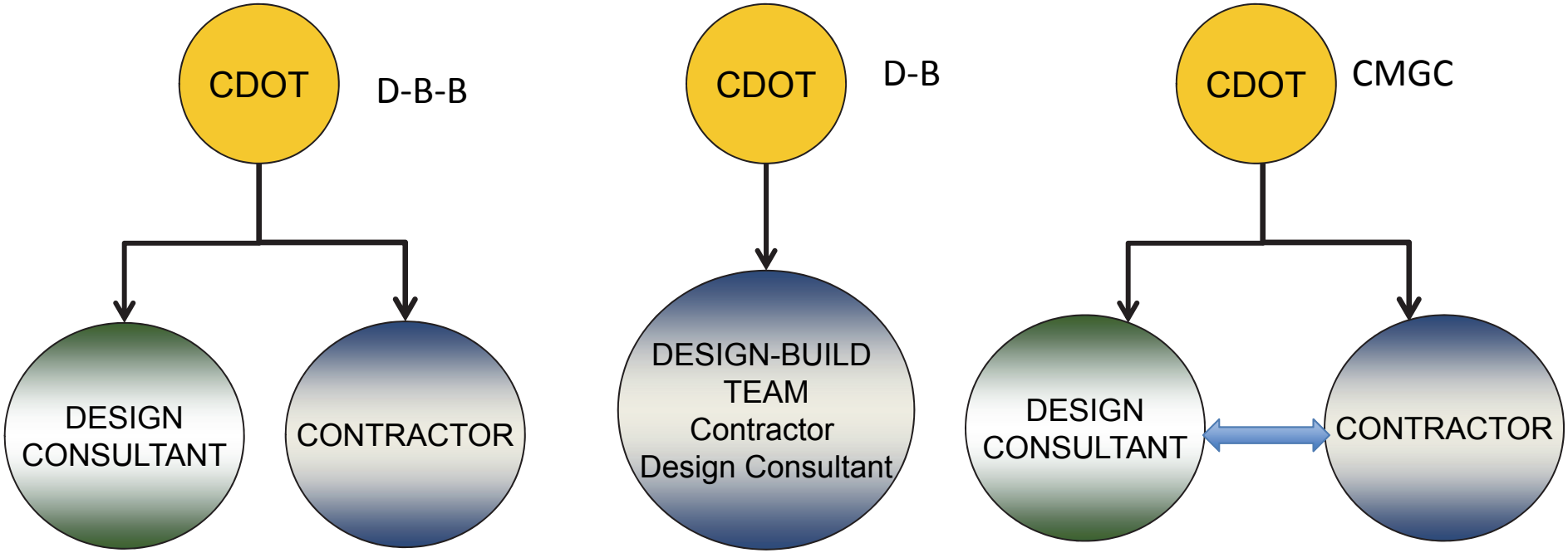
Contracting Structures



Delivery Method Comparisons

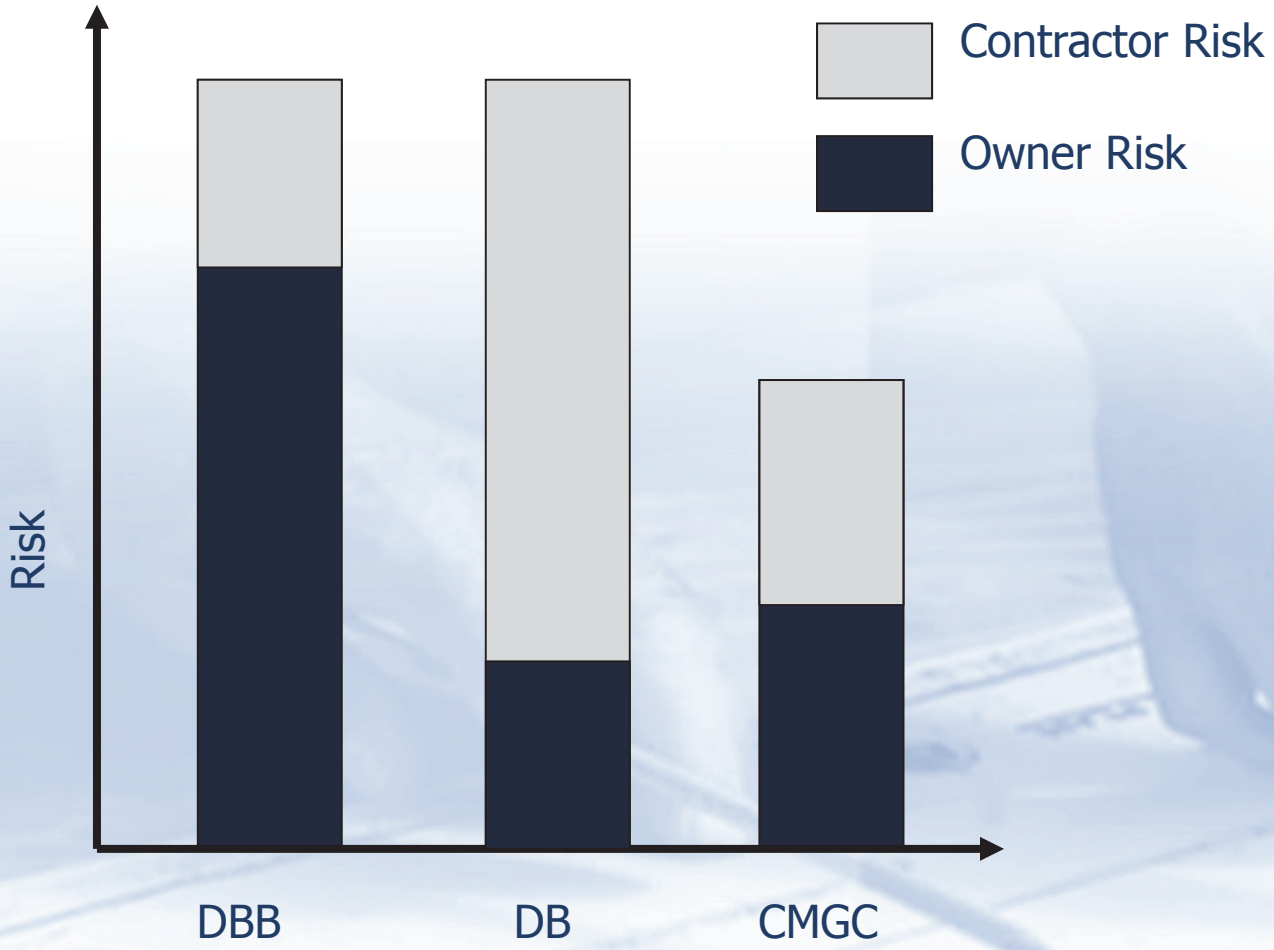
GENERAL SUITABILITY OF DELIVERY MODELS			
Project Traits	**D-B-B**	**CMGC**	**D-B**
Risk Management	Very limited	Very effective	Best for risk shifting
Collaboration w/Designer & Contractor	Very limited	Very collaborative	Moderate collaboration, contractual limitations
Price Certainty	None, subject to over-runs and change orders	Very effective, early price certainty during project development	Very effective, early price certainty during project development
Schedule Acceleration/ Compression	No ability to overlap design & construction, can accelerate construction with A+B	Ability to overlap design & construction, ability to optimize schedule not just accelerate	Ability to overlap design & construction, very effective for accelerating project delivery
Construction Quality	Low bid can compromise quality	Very beneficial to building a quality project	Very beneficial to building a quality project

Delivery Method Comparisons

GENERAL SUITABILITY OF DELIVERY MODELS			
Project Traits	**D-B-B**	**CMGC**	**D-B**
Innovation	Design Innovation only, very limited opportunities for contractor innovation	Very effective for capturing design and construction innovation	Very effective for capturing design and construction innovation
Constructability	Very difficult to obtain construction input during design	Optimal delivery method for obtaining construction input before design is complete	Effective delivery method for obtaining construction input before design is complete
Owner Control	High level control	Optimal level of owner control	Somewhat limited owner control, more performance based outcome
Competitive Pricing	High level	Somewhat limited, competitive markup not final project cost	Good Competition, but usually limited to short-listed teams

Delivery Method Comparisons

Risk Assessment



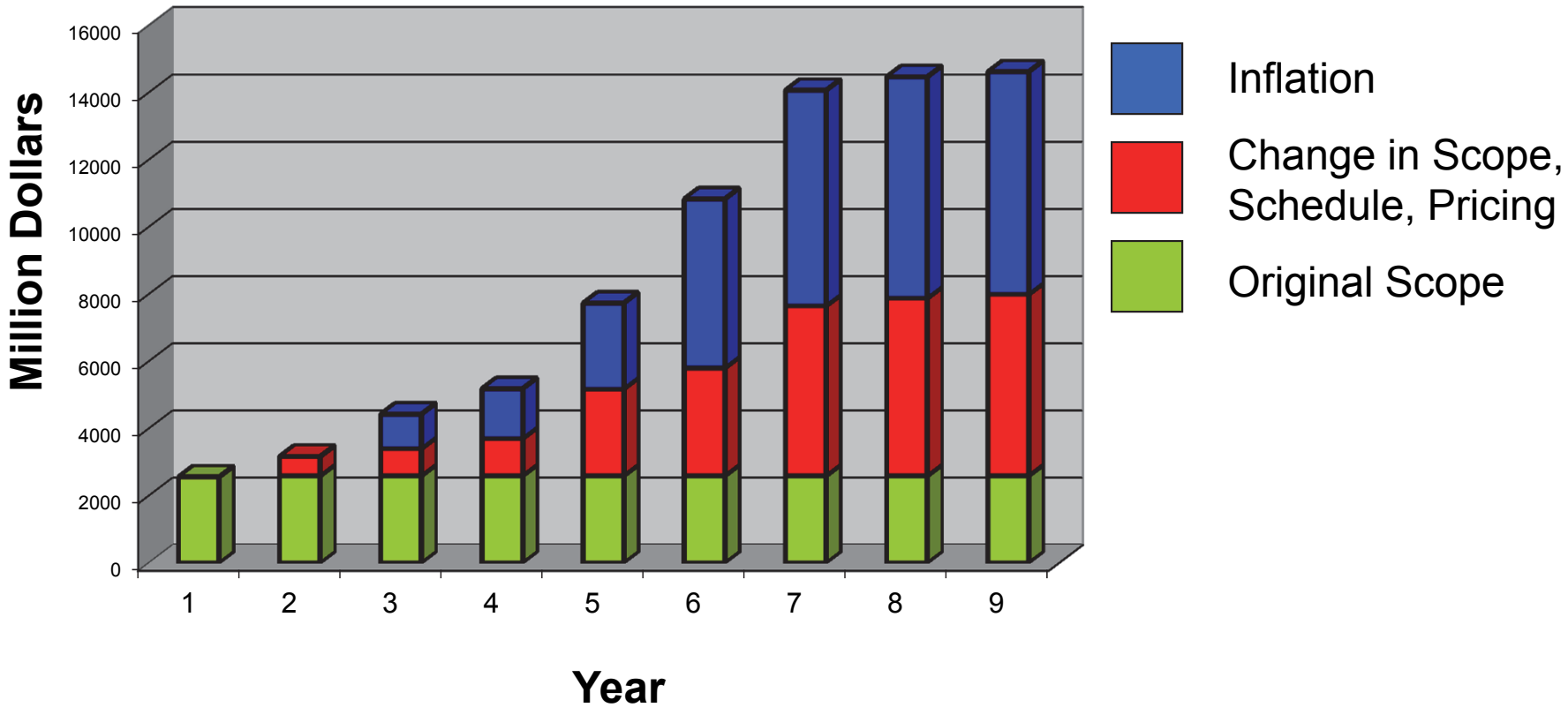
Questions?

Dr. Doug Gransberg, P.E., Ph.D. – Gransberg & Associates

Key Topics Covered

- Risk Based Estimating Concepts
- Risk Management Process
- WSDOT Process (Scalable for all projects)

Evolution of Cost for Boston Central Artery & Tunnel



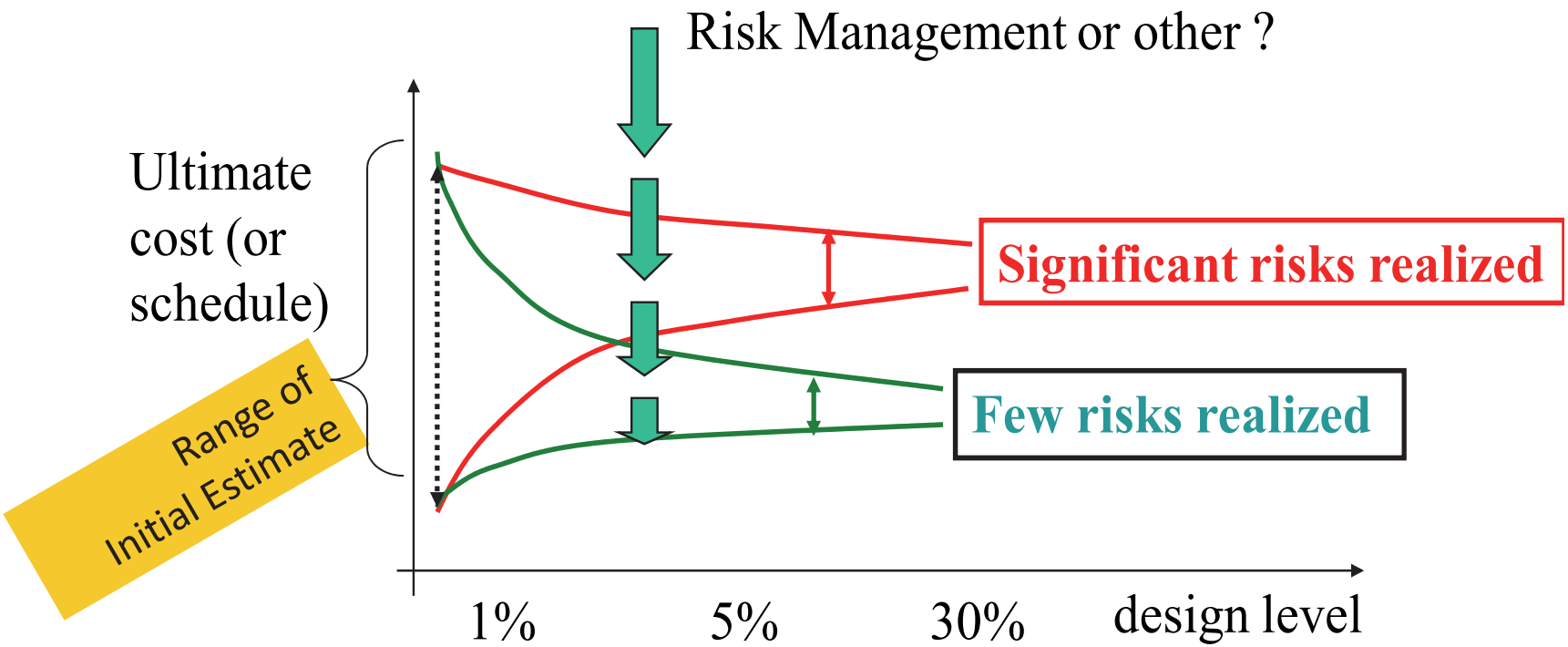
Risk Based Estimating

- Replaces contingency with clearly defined risks (threats & opportunities)
- Separates estimate into “base” & “risk”
- Validates base costs, focuses on risks & base uncertainties
- Characterizes risks in terms of consequences & likelihoods (probabilities)
- Inputs and outputs reported as a range

CER Concepts – Uncertainty (cont.)

Principle 2 – The Evolution of Uncertainty

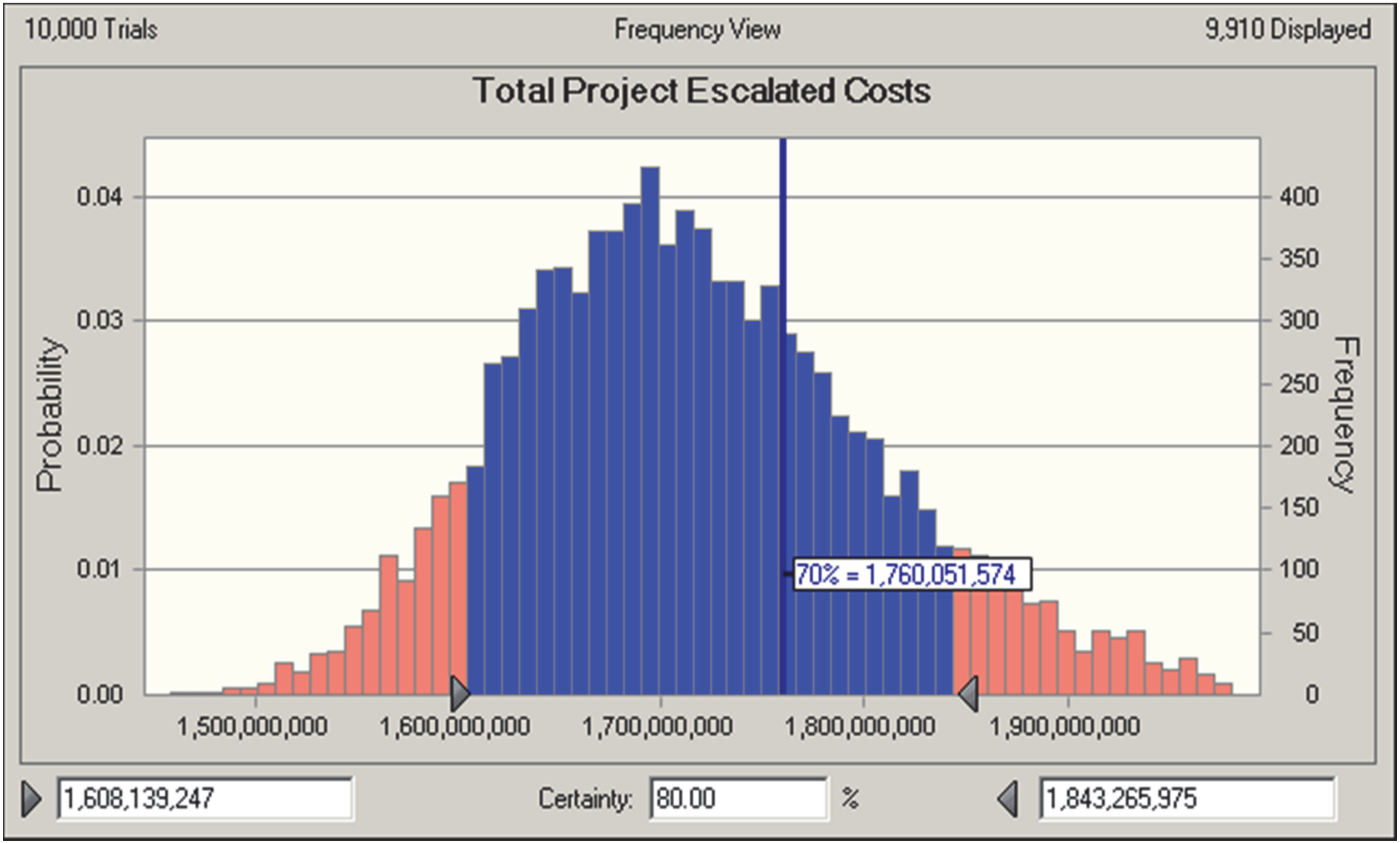
Uncertainty Decreases with Design Development



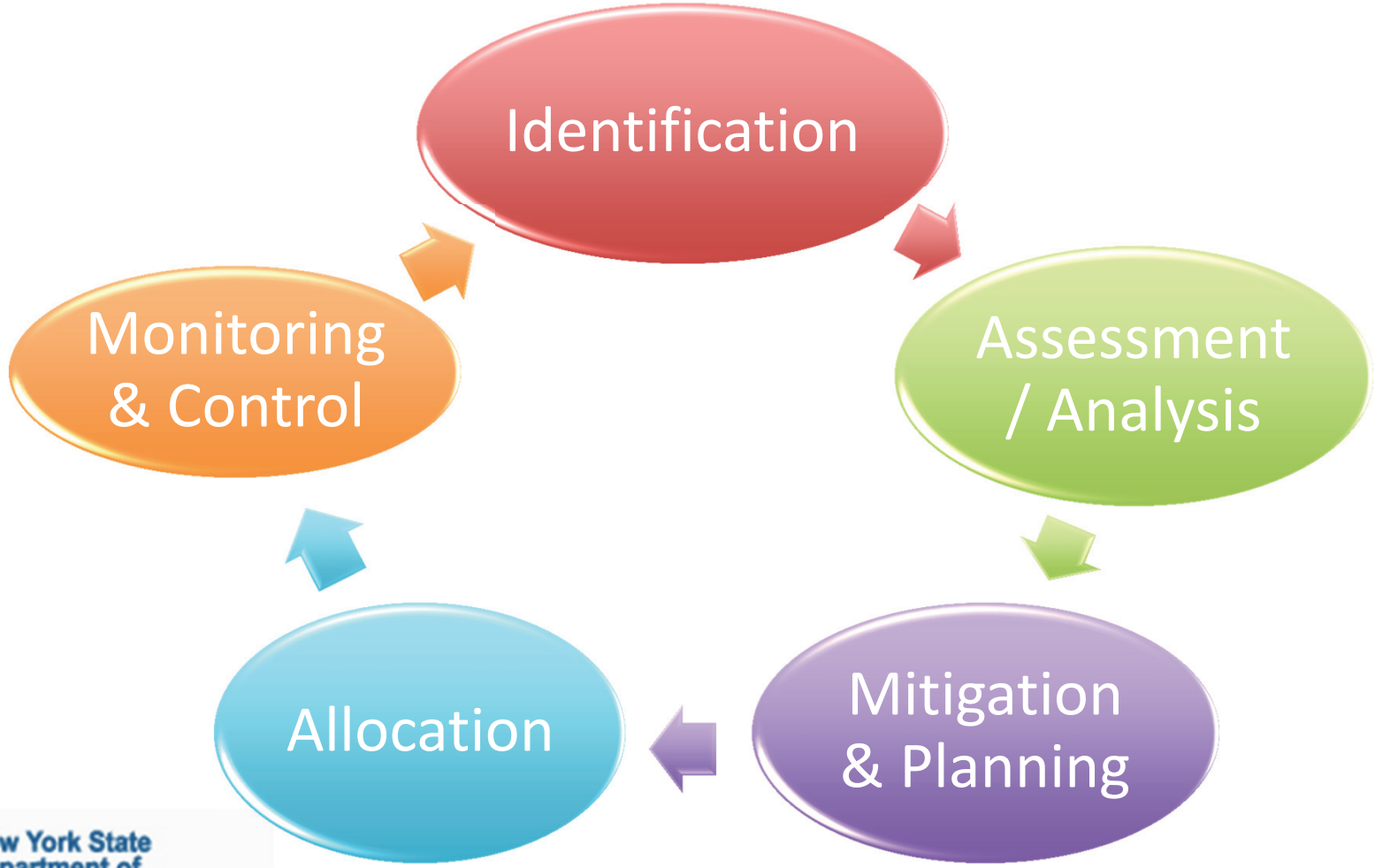
Cost Estimating Classification

Project Development Phase	Project Maturity (% project definition completed)	Purpose of the Estimate	Estimating Methodology	Estimate Range
Planning	0 to 2%	Conceptual Estimating—Estimate Potential Funds Needed (20-year plan)	Parametric (Stochastic or Judgment)	–50% to +200%
	1% to 15%	Conceptual Estimating—Prioritize Needs for Long-Range Plans (IRP—10-year plan)	Parametric or Historical Bid-Based (Primarily Stochastic)	–40% to +100%
Scoping	10% to 30%	Design Estimating—Establish a Baseline Cost for Project and Program Projects (IRP and STIP)	Historical Bid-Based or Cost-Based (Mixed, but Primarily Stochastic)	–30% to +50%
Design	30% to 90%	Design Estimating—Manage Project Budgets against Baseline (STIP, Contingency)	Historical Bid-Based or Cost-Based (Primarily Deterministic)	–10% to +25%
Final Design	90% to 100%	PS&E Estimating—Compare with Bid and Obligate Funds for Construction	Cost-Based or Historical Bid-Based Using Cost Estimate System (Deterministic)	–5% to +10%

CER Output - Sample Forecast Curve



Risk Management Process



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Level of Risk Assessment -WSDOT

	Project Size ($M)	Risk Assessment Level
Less Formal Risk Assessment	0 to 10	Project Team Risk Assessment Project Management Online Guide (PMOG) Risk Management Plan ***Qualitative Tool***
	10 to 25	Project Team Risk Assessment Self-Modeling Spreadsheet ***Quantitative Tool***
More Formal Risk Assessment (Workshops)	25 to 100	Cost Risk Assessment (CRA) Workshop ***Quantitative Tool***
	Over 100	Cost Estimate Validation Process (CEVP) Workshop ***Quantitative Tool***

Benefits of Risk Based Estimates

- Prior to NEPA: First time public is presented with the project cost estimate.
- Good project management practice: Create and maintain risk register.
- Helps promote communication among subject matter experts.
- Can be used on any project.
- Reduce “Uncertainty” at the bid table

Questions?

Craig Actis, PE
Project Management Engineer
FHWA Resource Center

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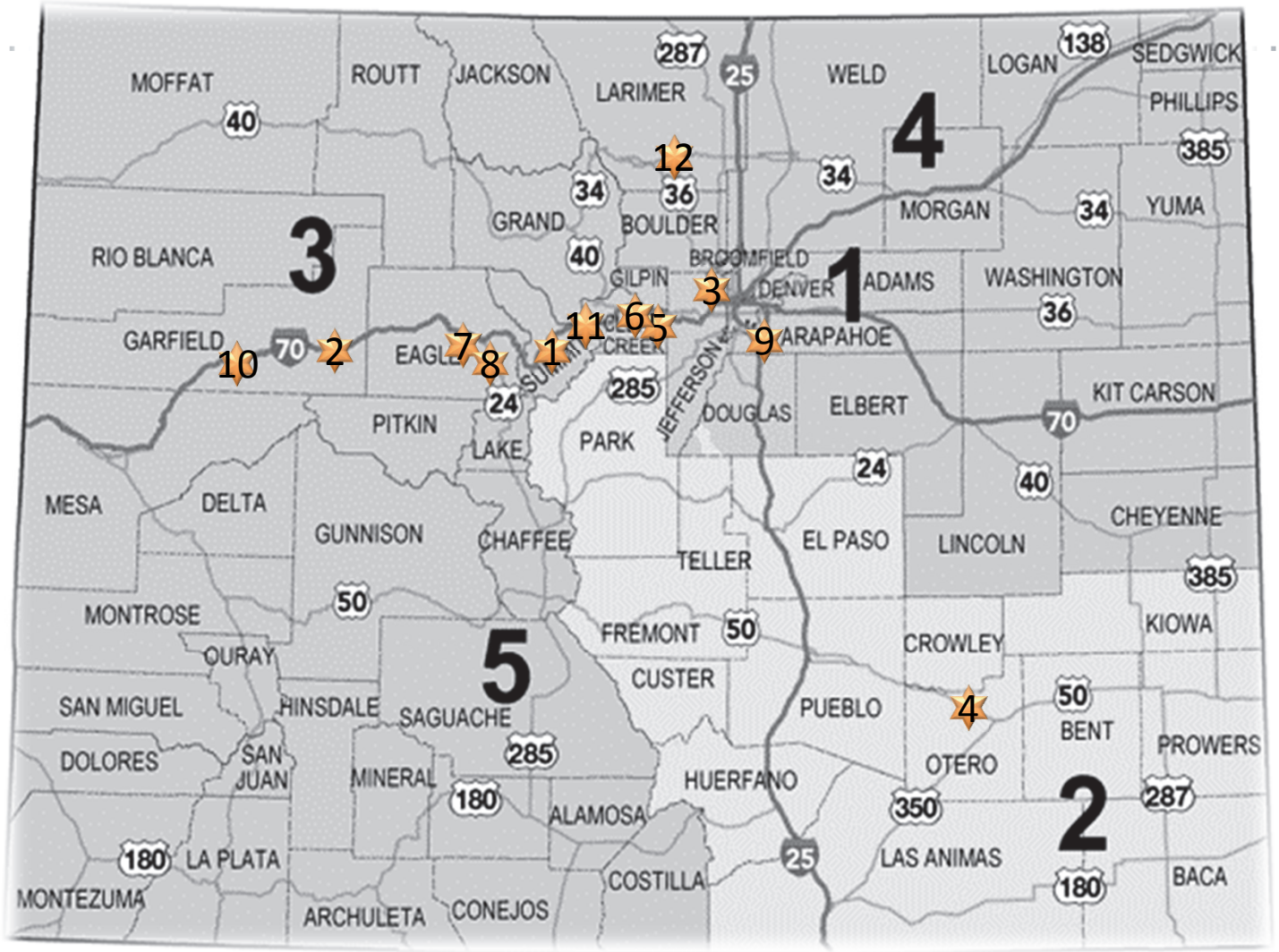

#	CDOT CMGC Project (since 2009)	Region
1	2400 Volt Switchgear	1
2	Dotsero Bridge	3
3	I-70/Pecos Bridge	1
4	Rocky Ford Bridge	2
5	Eastbound Twin Tunnels	1
6	Westbound Twin Tunnels	1
7	Eagle Interchange	3
8	Vail Underpass	3
9	I-25/Arapahoe Road	1
10	Grand Avenue	3
11	EB Peak Period Shoulder Lanes	1
12	US 34 Reconstruction	4

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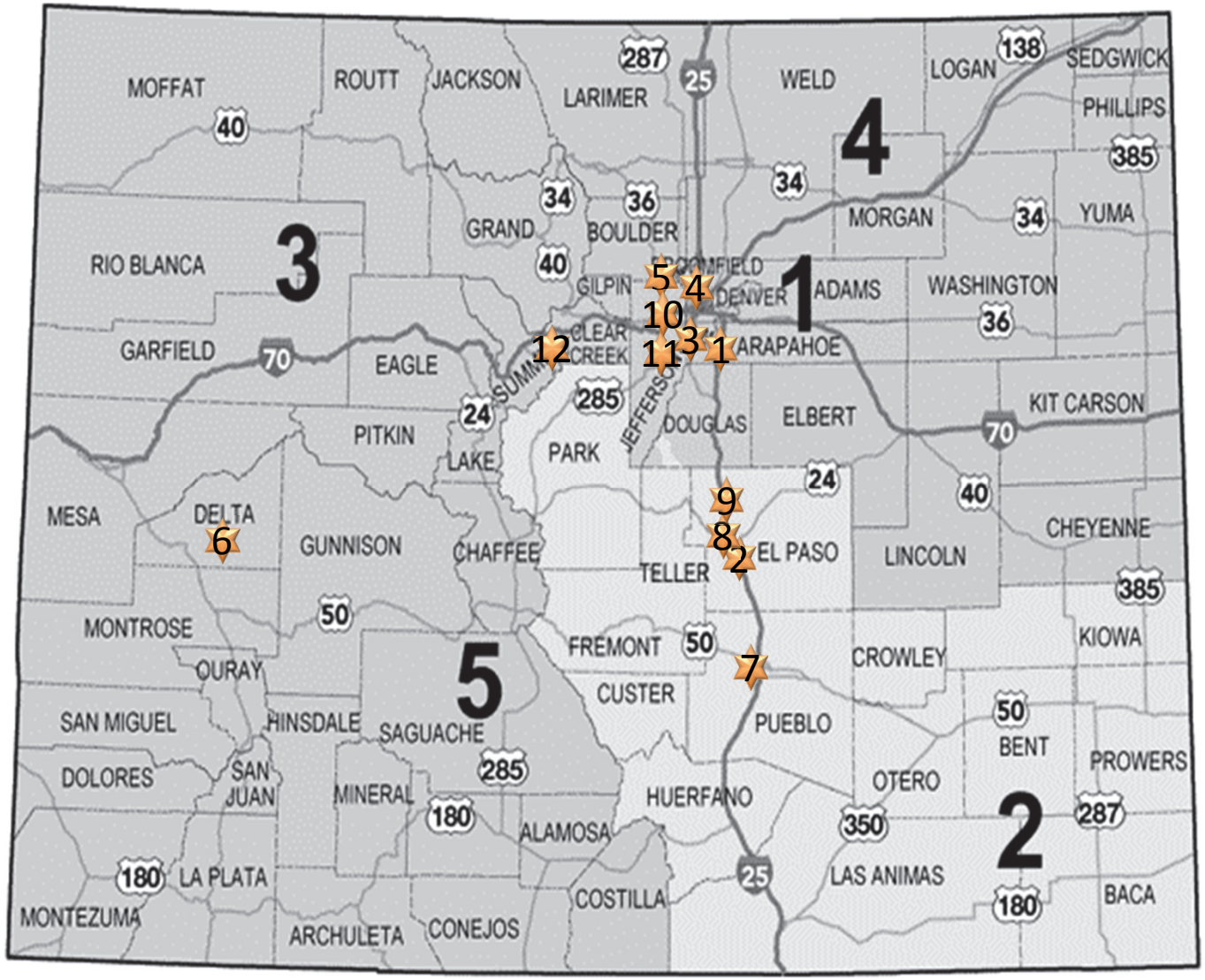

#	CDOT key Design-Build Projects (since 2005)	Region
1	TREX	1
2	COSMIX	2
3	US 285	1
4	120th Avenue	1
5	US 36	1
6	SH 92 Stengel's Hill	3
7	I-25/Ilex	2
8	I-25/Cimarron	2
9	I-25 N. of Colorado Springs	2
10	US 6	1
11	C-470	1
12	EJMT Fire Suppression System	1

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CMGC vs. Design-Bid-Build Case Study
Eisenhower Johnson Memorial Tunnel Switchgears

2400V Project (2010)	480V Project (2007)
CMGC	D-B-B
High Quality Equipment	Cheapest Equipment
Reduced Long Term Risk	No Risk Reduction
Higher Value	Lower Price
Equipment working well, easy to fix	Equipment not working properly, not easy to fix
Used 100% of design plans in construction	Used 10% of design plans in construction
No claims. No Disputes. No Change Orders.	No Claims. 12 Change Orders
$2.850 M Engineers Estimate	$4.524 M Engineers Estimate
$2.775 M Construction Contract	$2.948 Construction Contract
CMGC solicited vendor to assist with the design	$396,000 in Change Orders include VE savings

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EB and WB Twin Tunnels vs. Wolf Creek Tunnel Project Comparisons

EB and WB Twin Tunnels	Wolf Creek Pass
CMGC	D-B-B
2 Projects, 6 Phases	7 Projects
1 Contractor	6 Contractors
Few CDOT initiated change orders	Large number of change orders on each project
$10 million in savings at the end of EB	No savings
$7 Million in savings on WB from EB lessons learned	No opportunities for Lessons Learned
$118.5 million in contractor awards	$50.5 million total contractor awards
Zero Claims	5 Claims, $6 Million in claim settlements, 12% additional
Both projects finished ahead of schedule	Schedule Delays

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Summary

Wrap-Up

Q& A