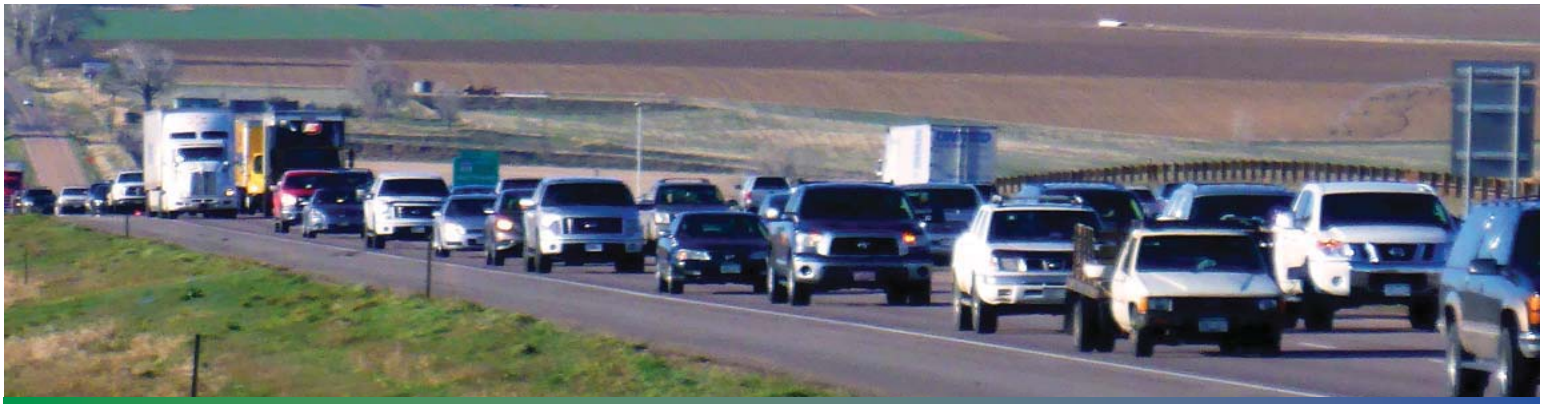

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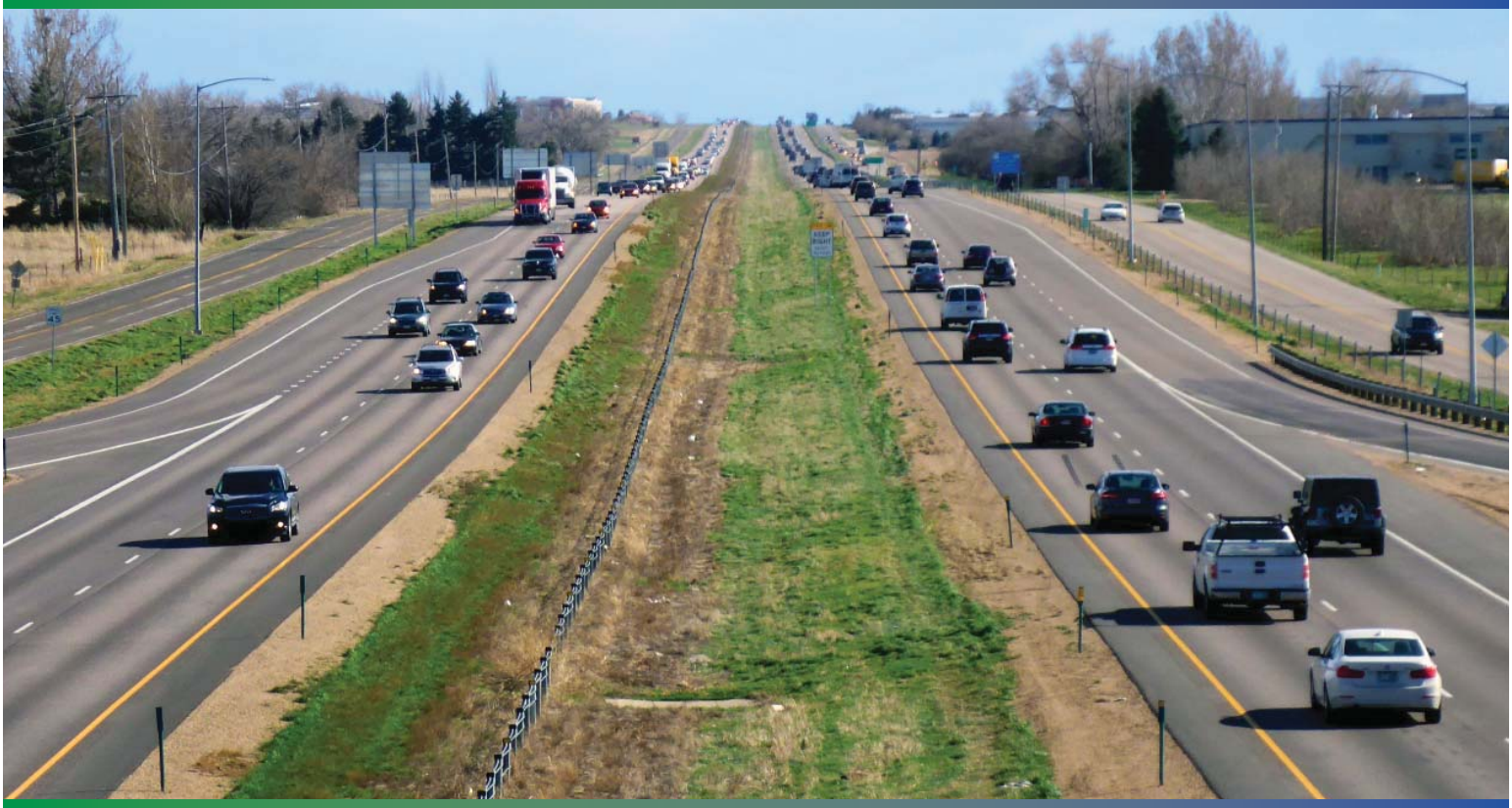
Project Delivery Selection Matrix

AUGUST 2016



PREPARED BY

COLORADO
Department of Transportation

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Project Delivery Selection Workshop Summary (SEPTEMBER 2014 VERSION)

Workshop Summary	
Project Name:	I-25, SH 402 to SH 14 Reconstruction (21506)
Workshop Date:	May 26, 2016
Workshop Location:	CDOT Region 4, Greeley
Facilitator:	Project team
Delivery Method Selected:	Design-Build

Workshop Participants	
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Project Delivery Selection Matrix

Overview

This document provides a formal approach for selecting project delivery methods for highway projects. The information below lists the project delivery methods followed by an outline of the process, instructions, and evaluation worksheets for use by CDOT staff and project team members. By using these forms, a brief Project Delivery Selection Report can be generated for each individual project. The primary objectives of this tool are:

- Present a structured approach to assist Agencies in making project delivery decisions;
- Assist Agencies in determining if there is a dominant or optimal choice of a delivery method; and
- Provide documentation of the selection decision.

Background

The project delivery method is the process by which a construction project is comprehensively designed and constructed including project scope definition, organization of designers, constructors and various consultants, sequencing of design and construction operations, execution of design and construction, and closeout and start-up. Thus, the different project delivery methods are distinguished by the manner in which contracts between the agency, designers and builders are formed and the technical relationships that evolve between each party inside those contracts. Currently, there are several types of project delivery systems available for publicly funded transportation projects. The most common systems are Design-Bid-Build (DBB), Design-Build (DB), and Construction Manager/General Contractor (CMGC). No single project delivery method is appropriate for every project. Each project must be examined individually to determine how it aligns with the attributes of each available delivery method.

Primary delivery methods

Design-Bid-Build is the traditional project delivery method in which an agency designs, or retains a designer to furnish complete design services, and then advertises and awards a separate construction contract based on the designer's completed construction documents. In DBB, the agency "owns" the details of design during construction and as a result, is responsible for the cost of any errors or omissions encountered in construction.

Design-Build is a project delivery method in which the agency procures both design and construction services in the same contract from a single, legal entity referred to as the design-builder. The method typically uses Request for Qualifications (RFQ)/Request for Proposals (RFP) procedures rather than the DBB Invitation for Bids procedures. The design-builder controls the details of design and is responsible for the cost of any errors or omissions encountered in construction.

Construction Manager / General Contractor is a project delivery method in which the agency contracts separately with a designer and a construction manager. The agency can perform design or contract with an engineering firm to provide a facility design. The agency selects a construction manager to perform construction management services and construction works. The significant characteristic of this delivery method is a contract between an agency and a construction manager who will be at risk for the final cost and time of construction. Construction industry/Contractor input into the design development and constructability of complex and innovative projects are the major reasons an agency

would select the CMGC method. Unlike DBB, CMGC brings the builder into the design process at a stage where definitive input can have a positive impact on the project. CMGC is particularly valuable for new non-standard types of designs where it is difficult for the agency to develop the technical requirements that would be necessary for DB procurement without industry input.

Facilitation of the tool

When embarking on using the project delivery selection tool for the first time, it is recommended that a facilitator is brought in for the workshop. The facilitator will assist with working through the tool and provide guidance for discussing the project and selection of a delivery method. This individual should be knowledgeable about the process and should be consistently used. The facilitator also helps to answer questions and make sure the process stays on track and the team moves towards a formal selection.

Participation

Using the project delivery selection matrix is only as good as the people who are involved in the selection workshop. Therefore, it is necessary to have a collection of individuals to participate in the selection of the delivery method. The selection team needs to include the project manager, the project engineer, a representative of the procurement/contracting office, and any other CDOT staff that is crucial to the project. In addition, the selection team might want to consider including representatives from specialty units and from the local jurisdictions where the project is located. However, it is important to keep the selection team to a minimum amount of participants. Otherwise, the selection process can take a long time to complete. Normally, 3-7 people represent a selection team, but this number should be based on the specific project being analyzed.

Potential bias

The best approach for the participants of the workshop is to keep an open mind about the delivery method to choose. However, there might be participants that have a preconceived notion about the delivery method to use on a project. When this occurs, it is best to discuss that person's ideas with the entire selection team at the beginning of the workshop. Putting that person's ideas on the table helps others to understand the choice that person has in mind. Then, it is important to acknowledge this person's ideas, but to remind that person to keep an open mind as the team works through the selection process.

Pre-workshop Tasks

Before conducting the selection workshop, a few tasks can be completed by the workshop participants. Preparing for the workshop prior to conducting it will result in a much more concise and informative session. It is advised that participants review all known project information, goals, risks, and constraints prior to the workshop. The best approach is to complete the *Project Delivery Description*, the *Project Delivery Goals*, and the *Project Delivery Constraints* worksheets before conducting the workshop. Completing the three worksheets will shorten the time needed to review the project and allows the workshop team to move right into the selection process.

Project Delivery Selection Process

The process is shown in the outline below and a flowchart on the next page. It consists of individual steps to complete the entire process. The steps should be followed in sequential order.

STAGE I - Project Attributes, Goals, and Constraints

A. Delivery methods to consider
    1. Design-Bid-Build
    2. Design-Build
    3. Construction Manager / General Contractor

B. Project Description/Goals/Constraints
    1. Project attributes
    2. Set project goals
    3. Identify project dependent constraints
    4. Discuss project risks

STAGE II – Primary Factor Evaluation

A. Assess the primary factors (these factors most often determine the selection)
    1. Complexity and Innovation
    2. Delivery Schedule
    3. Project Cost Considerations
    4. Level of Design

B. If the primary factors indicate there is a clear choice of a delivery method, then:
    5i. Perform a risk assessment for the desired delivery method to ensure that risks can be properly allocated and managed, and then move on to Stage III Part A

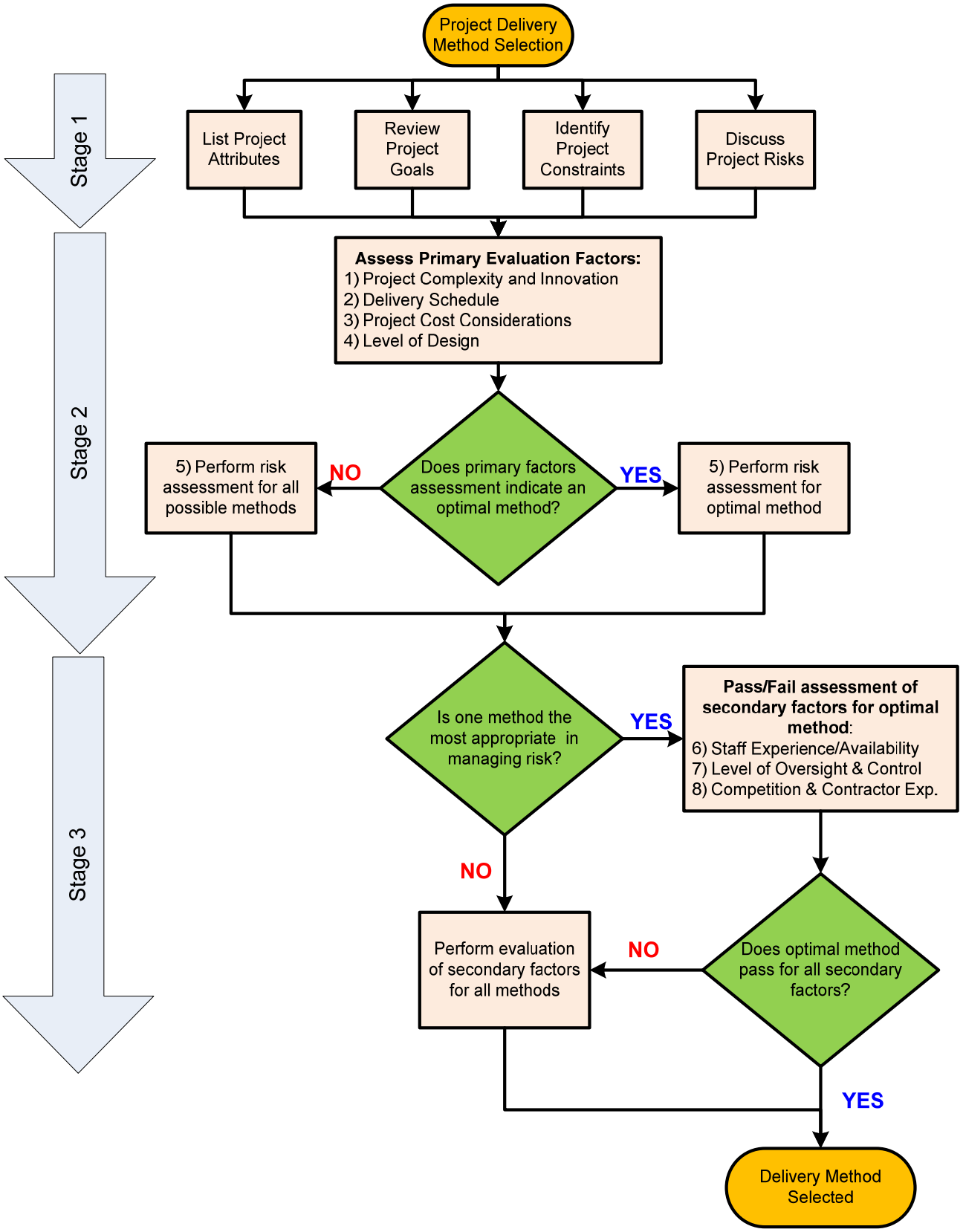
C. If the primary factors do not indicate a clear choice of a delivery method, then:
    5ii. Perform a risk assessment for all delivery methods to determine which method can properly allocate and manage risks, and then move on to Stage III Part B

STAGE III – Secondary Factor Evaluation

A. Perform a pass/fail analysis of the secondary factors to ensure that they are not relevant to the decision.
    6. Staff Experience/Availability (Agency)
    7. Level of Oversight and Control
    8. Competition and Contractor Experience

B. If pass/fail analysis does not result in clear determination of the method of delivery, then perform a more rigorous evaluation of the secondary factors against all potential methods of delivery

NOTE: Typically, the entire selection process can be completed by the project team in a 3 hour workshop session, as long as each team member has individually reviewed and performed the assessment prior to the workshop.



Flowchart of the Project Delivery Selection Process

Project Delivery Selection Matrix Worksheets and Forms

The following forms and appendices are included to facilitate this process.

Project delivery description worksheet

Provide information on the project. This includes size, type, funding, risks, complexities, etc. All information should be developed for the specific project.

Project delivery goals worksheet – including example project goals

A careful determination of the project goals is an instrumental first step of the process that will guide both the selection of the appropriate method of delivery for the project.

Project delivery constraints worksheet - including example project constraints

Carefully review all possible constraints to the project. These constraints can potentially eliminate a project delivery method before the evaluation process begins.

Project risks worksheet

In addition to project goals and constraints, a detailed discussion of project risks is a critical step that helps with evaluation of the selection factors.

Project delivery selection summary form

The Project Delivery Selection Summary summarizes the assessment of the eight selection factors for the three delivery methods. The form is qualitatively scored using the rating provided in the table below. The form also includes a section for comments and conclusions. The completed Project Delivery Selection Summary should provide an executive summary of the key reasons for the selection of the method of delivery**.**

Rating Key	
++	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

Workshop blank form

This form can be used by the project team for additional documentation of the process. In particular, it can be used to elaborate the evaluation of the *Assessment of Risk* factor.

Project delivery methods selection factor opportunities / obstacles form

These forms are used to summarize the assessments by the project team of the opportunities and obstacles associated with each delivery method relative to each of the eight Selection Factors. The bottom of each form allows for a qualitative

conclusion using the same notation as described above. Those conclusions then are transferred to the *Project Delivery Selection Summary Form***.**

Project delivery methods opportunities / obstacles checklists

These forms provide the project team with direction concerning typical delivery method opportunities and obstacles associated with each of the eight Selection Factors. However, these checklists include general information and are not an all-inclusive checklist. Use the checklists as a supplement to developing project specific opportunities and obstacles.

Risk assessment guidance form

Because of the unique nature of Selection Factor 5, *Assessment of Risk*, this guidance section provides the project team with additional assistance for evaluation of the risk factor including: Typical Transportation Project Risks; a General Project Risks Checklist; and a Risk Opportunities/Obstacles Checklist.

Project Delivery Description

The following items should be considered in describing the specific project. Other items can be added to the bottom of the form if they influence the project delivery decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
Project Name: I-25, SH 402 to SH 14 Reconstruction
Location: Larimer County, Colorado
Estimated Budget: $237,000,000
Estimated Project Delivery Period: 5 years. Design procurement 5/2016 to 9/2017, Construction 1/2018 to 12/2020
Required Delivery Date (if applicable): No required date at this time. Potential funding may have delivery date constraints
Source(s) of Project Funding: Federal, State, and Local (Potential TIGER or FASTLane, or influx of local)
Project Corridor: North I-25, Denver to Wyoming
Major Features of Work – pavement, bridge, sound barriers, etc.: Pavement, tolling, bridges, drainage, sound barrier, right of way,
Major Schedule Milestones: • Acquire ROW • Environmental clearance • Design procurement completion • Construction complete by funding requirements • Selection by Fall 2017 with construction beginning in 2018
Major Project Stakeholders: FHWA, CDOT, HPTE, City of Fort Collins, Johnstown, Larimer County, Loveland, NFRMPO, Timnath, Centerra/McWhinney (funding participant), Windsor (funding participant), CSP 3rd parties: UPRR, GWRR, Ditch Companies
Major General Obstacles: Environmental, Variable Funding, ROW Acquisition, Utilities, Contract Execution, Traveling Public, Railroads
Major Obstacles with Right of Way, Utilities, and/or Environmental Approvals: • City of Fort Collins ROW acquisition • FEMA – CLOMR at Cache La Poudre River and Big Thompson River • Irrigation ditch company coordination and approval • Railroad coordination • Possible to minimize/eliminate permanent right-of-way and only need temporary construction easements. • Utilities, including possible relocations/lowering of fiber lines, Greeley Water coordination • ROD (may slow down project)

Project Attributes
Major Obstacles during Construction Phase: • Phasing of the bridge replacement • Traffic handling/minimizing traveling public disruption • Construction over the Cache La Poudre River • Maintaining access for CSP • Coordination of irrigation work with irrigation companies • Coordination with Crossroads construction (two contractors in same area) • Business impacts if SH 402 or Prospect interchanges included
Safety Issues: • General safety during highway construction • Safety issues associated with working near waterways • Elements determined to be safety critical
Sustainable Design and Construction Requirements: Project elements required per EIS. Water quality considerations.

Project Delivery Goals

An understanding of project goals is essential to selecting an appropriate project delivery method. Therefore, project goals should be set prior to using the project delivery selection matrix. Typically, the project goals can be defined in three to five items and need to be reviewed here. Example goals are provided below, but the report should include project-specific goals. These goals should remain consistent over the life of the project.

Project-Specific Goals
Goal #1: Improve mobility and traffic operations Growth in Northern Colorado has diminished mobility on I-25. Congestion is experienced daily between Longmont and the north side of Fort Collins. This project will reduce congestion by enhancing and improving operations on the mainline and at interchanges. This project will increase capacity by adding an express lane. The express lane provides trip reliability for HOV, transit and SOVs that chose to pay a toll. This project should also improve capacity and operations in the general purpose lanes. In addition, the project will install emerging technology and innovation in the corridor (e.g. message boards, travel time, real time information, connected vehicles, infrastructure, etc), so road users can make informed decisions with regard to how to utilize the facilities and improve mobility. **Goal #2: Maximize the scope with the available fiscal resources** I-25 is a priority for CDOT and the North Front Range. The State of Colorado has limited funds for highway construction and maintenance. The most has to be done with the available funding to provide relief in the most problematic locations. In order to improve these problem areas for the traveling public sooner, the project team would like to find solutions to leverage the available funding to maximize overall mobility and the length of the EIS Preferred Alternative improvements constructed and within the project limits.

Goal #3: Provide a safe facility for the public as well as a safe work zone for construction and the travelling public

Safety is of paramount importance during construction and post construction. The proposed phasing should maximize safety refuges (shoulders), minimize traffic shifts and head to head traffic configurations during construction. The safety of the final design should meet or exceed current AASHTO policy on design. The safety of all users including first responders should be improved, while still allowing for safe passage of the travelling public during incidents.

Goal #4: Increase intermodal connections

CDOT wants this project to improve connectivity among transit, bicycles and pedestrians. The project should consider the connectivity of the transit, access to the managed lanes and stations through the area of improvements. As a part of the intermodal improvements, this project will construct a new connection and Transit Center (Park n Ride) north of US-34 at Kendall Parkway for Bustang service and car-poolers. In addition, this project will improve connectivity for trail users. At a minimum a new trail connection on the Poudre River Trail will be added to improve bicycle commuter routes between communities west of I-25 to communities east of I-25 as outlined in the Governor's Colorado Pedals Project.

Goal #5: Ensure the longevity of the project (creating the most value out of the investment now, and building a high quality project)

This project will replace the aging infrastructure and accommodate the future build out of the FEIS Preferred Alternative. CDOT wants to maximize the infrastructure constructed with this project to be consistent and useable for completing the FEIS Preferred Alternative. To the extent possible CDOT wants the new facility to be out of the 100 year floodplain especially for any bridges over a floodplain that are replaced.

Project Delivery Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible delivery methods. A list of general constraints can be found below the table and should be referred to after completing this worksheet. The first section below is for general constraints and the second section is for constraints specifically tied to project delivery selection.

General Constraints
Source of Funding: Federal, State, and Local. Federal funding may have obligation dates. At this time, these dates are not expected to drive schedule. HTPE loan.
Schedule constraints: Minimize impacts to traveling public, time value of money, toll revenue collections asap, desire to want to be under construction in winter 2017. TIGER grant money, if obtained would need to be obligated by Sept 2019.
Federal, state, and local laws: Yes, specifically FEMA and MS4 requirements
Third party agreements with railroads, ROW, etc: • Permanent ROW and temporary construction easements • Third party H&H approvals (Larimer County, CWCB, etc) • Possible IGA with the City of Fort Collins for Arapahoe Bend Natural Area • IGA's for funding participants • DTR agreement • E-470 agreement • Railroad agreements with UPRR and GWRR • Ditch company agreements • Utility company agreements

Project Delivery Specific Constraints
Project delivery constraint #1: EIS impacts and mitigation Be consistent with EIS impacts and implement mitigation measures.
Project delivery constraint #2: MS-4 This project is within an MS-4 area and must adhere to the permit. The current criteria states that all the additional impervious area must be treated. Issue if staying within ROW
Project delivery constraint #3: Maintaining Traffic Area is highly constrained, and future alignment is in same location in some areas. Constructing bridges in generally the same location at some locations will require detour alignments of I-25.
Project delivery constraint #4: Funding Dynamic funding environment – scalable project to meet funding.
Project delivery constraint #5: Hydrology/Hydraulic Changes and Approvals The flows have increased by 10,000 cfs at Big Thompson River, and the channel geometry has substantially changed. Significant analysis and likely CLOMR required. Poudre River coordination with City of Fort Collins and hydrology changes.

Project Risks

Identified Project Risks
Project Risk: Uncertain funding amount. Project needs to be scalable – up and down.
Project Risk: Traveling Public. Need to replace bridges will require some closures, particularly on the frontage road
Project Risk: Drainage/Water Quality and Complex floodplain issues. • Completely new hydrology, significantly higher, channel changes • Major coordination effort with other local stakeholders as well as possible IGA. The approval process of the CLOMR may become a critical path issue due to timing.
Project Risk: Project staffing and oversight. Providing adequate project oversight and management of this project and additional final design/construction projects in Region 4 may be difficult as current staff is already busy.
Project Risk: ROW Acquisitions. The ROW acquisition process will be a critical path issue due to the time it will take to acquire the parcels needed to begin construction.
Project Risk: Environmental Approvals. Project will need a new ROD.
Project Risk: FHWA approvals. Ensuring focus on FHWA major project requirements – specific to project and corridor approvals (CER and Financial Plan updates)
Project Risk: Tolling and revenue results Unknown loan amount until later in delivery process, prior to construction contract award
Project Risk: Railroad approval
Project Risk: Coordination with Ditch Companies and Condition of their existing Facilities.

General Risk Categories to Consider

1. Site Conditions and Investigations
2. Utilities
3. Railroads
4. Drainage/Water Quality
5. Environmental
6. Third-party Involvement
7. Organizational
8. Design
9. Construction
10. Right-of-Way

Project Delivery Selection Summary

Determine the factors that should be considered in the project delivery selection, discuss the opportunities and obstacles related to each factor, and document the discussion on the following pages. Then complete the summary below.

Project Delivery Method Opportunity/Obstacle Summary			
	DBB	**DB**	**CMGC**
Primary Selection Factors	**–**	**++**	**+**
1. Project Complexity & Innovation	**-**	**++**	**0**
2. Project Delivery Schedule	**0**	**+**	**0**
3. Project Cost Considerations	**-**	**++**	**+**
4. Level of Design	**-**	**+**	**0**
5. Risk Assessment	**+**	**-**	**+**
Secondary Selection Factors	**+**	**0**	**–**
6. Staff Experience/Availability (Agency)	**+**	**0**	**-**
7. Level of Oversight and Control	**+**	**-**	**-**
8. Competition and Contractor Experience	**+**	**+**	**0**

Rating Key	
++	Most appropriate delivery method
+	Appropriate delivery method
0	Neutral delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

Project Delivery Selection Summary Conclusions and Comments

The project team met on May 26, 2016 to complete the PDSM. The results were reviewed by CDOT Region 4 staff and discussed further at project progress meetings. After reviewing the project goals and risks, **the team has selected Design Build as the preferred delivery method**. The main benefits of selecting design build were:

(a) Maximize Scope: CDOT wants to maximize scope for the available funds through the use of ARE's. This project is one of many in the North Front Range on I-25. Funding is limited and CDOT wants to build as much as possible with the available funding. If the project comes in under budget, we want to build more. This is also a project goal. This is not easily done using design bid build. CMGC would allow for an expandable scope.

(b) Generate Competition and Innovation: A design build project will allow contractors to compete to determine which team can give CDOT the most scope within our budget using innovative designs (Best Value). This is also not easily accomplished using design-bid-build. CMGC could foster some innovation, but not from several teams and with a competitive price.

(c) Flexibility in Scope: The total funding is still not set. It is easier to adjust project scope and keep a design build project on schedule vs a traditional design bid build or CMGC. Other delivery methods that require complete designs which take more time and cost to adjust.

(d) Quality: The design build selection process and subsequent contractor lead Quality Control program will provide a high quality final product,

Project Delivery Selection Matrix Primary Factors

1) Project Complexity and Innovation

Project complexity and innovation is the potential applicability of new designs or processes to resolve complex technical issues.

DESIGN-BID-BUILD Allows Agency to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by Agency/Consultant expertise and through traditional agency directed processes such as VE studies and contractor bid alternatives.		
Opportunities	**Obstacles**	**Rating**
Agencies control of design of complex projects	Agency and consultant expertise can select innovation independently of contractor abilities	-
Opportunities for value engineering studies during design, more time for design solutions	Complex design can be resolved and competitively bid	
Aids in consistency and maintainability	Innovations can add cost or time and restrain contractor's benefits	
Full control in selection of design expertise	No contractor input to optimize costs	
	Limited flexibility for integrated design and construction solutions (limited to constructability)	
	Difficult to assess construction time and cost due to innovation	
CMGC Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of Agency, designer and Contractor. Allows for a qualitative (non-price oriented) design but requires agreement on CAP.		
Opportunities	**Obstacles**	**Rating**
Highly innovative process through 3 party collaboration	Process depends on designer/CM relationship	+
Allows for agency control of a designer/contractor process for developing innovative solutions	No contractual relationship between designer/CM	
Allows for an independent selection of the best qualified designer and best qualified contractor	Management of scope additions	
Risk of innovation can be better defined and minimized and allocated		
DESIGN-BUILD Incorporates design-builder input into design process through best value selection and contractor proposed Alternate Technical Concepts (ATCs) – which are a cost oriented approach to providing complex and innovative designs. Requires that desired solutions to complex projects be well defined through contract requirements.		
Opportunities	**Obstacles**	**Rating**
Designer and contractor collaborate to optimize means and methods and enhance innovation	Requires desired solutions to complex designs to be well defined through technical requirements	++
Opportunity for innovation through competiveness of ATC process	Qualitative designs can be difficult to define if not done early in design (example. aesthetics)	
Can use best-value procurement to select design-builder with best qualifications	time or cost constraints on designer	
Constructability and VE inherent in process		
Early team integration		
Ability to obtain intellectual property through the use of stipends		

2) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. Assess time considerations for starting the project or receiving dedicated funding and assess project completion importance.

DESIGN-BID-BUILD Requires time to perform sequential design and procurement, but if design time is available has the shortest procurement time after the design is complete.		
Opportunities	**Obstacles**	**Rating**
It is potentially a shorter procurement period given the level of design in this project	The schedule is not optimized based on contractors capabilities	0
	Milestones can be defined, however, not as effective without the contractor's input	
	Unrealistic design and construction schedules	
	Owner owns design, and errors can lead to change orders and schedule delays	
CMGC Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule. However, schedule can be slowed down by coordinating design-related issues between the CM and designer and by the process of reaching a reasonable CAP.		
Opportunities	**Obstacles**	**Rating**
The ability to do phased packages allows for certain items to be pushed forward in comparison to DBB or DB	Efficient procurement of long-lead items may be advantageous to the contractor, but negotiation determines whether it benefits the project	0
Team involvement may be greater in this case with earlier engagement of contractor for discussion of phasing, vs in a design-build	Procurement, solely based on the selection of a contractor is fast, however, negotiation of GMP and pricing can be drawn out	
	It takes a strong owner, and time, to ensure VE is occurring	
DESIGN-BUILD Ability to get project under construction before completing design. Parallel process of design and construction can accelerate project delivery schedule; however, procurement time can be lengthy due to the time necessary to develop an adequate RFP, evaluate proposals and provide for a fair, transparent selection process.		
Opportunities	**Obstacles**	**Rating**
Shifting of schedule risk from the owner to the contractor	RFP development and procurement process can be intensive and longer	+
Ability to begin construction before entire design, parallel design-build process, is a great benefit	Railroads, communities, utilities will require thoughtful attention and commitment to expedite review of design	
Allows innovation in resource loading and scheduling by DB team ++		

3) Level of Design

Level of design is the percentage of design completion at the time of the project delivery procurement.

DESIGN-BID-BUILD 100% design by Agency or contracted design team, with Agency having complete control over the design.		
Opportunities	**Obstacles**	**Rating**
100% design complete by CDOT	Reduced potential for innovation and value-added processes inherent in other delivery methods / less competitive innovation opportunities (i.e. no ATC process)	-
Control by CDOT of the design	Lack of early constructability buy-in	
DBB Processes are well-known to the industry	Less integration of Design phase with Construction phase, which may result in more potential for inter-organizational issues	
	Unforeseen items result in cost and schedule risks and disputes	
	If multiple optimized solutions are possible, therefore having contractor input would maximize value	
CMGC Can utilize a lower level of design prior to procurement of the CMGC and then joint collaboration of Agency, designer, and CMGC in the further development of the design. Iterative nature of design process risks extending the project schedule.		
Opportunities	**Obstacles**	**Rating**
In this process, a lower level of design can be used prior to selection of a contractor to advance the design collaboratively (owner, designer, contractor)	Design process can be extended significantly	+
	If price and GMP is not successfully negotiated, design can be used for DBB, however, schedule and cost can potentially increase significantly	
DESIGN-BUILD Design advanced by Agency to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less).		
Opportunities	**Obstacles**	**Rating**
Increased potential for innovation and added-value through ATC process	Loss of Control of design by the owner	++
The owner defines the design to a level that is comfortable enough for the owner to make informed decisions	Balancing the appropriate level of flexibility (performance-based vs prescriptive specifications) resulting in reduced potential for quality	
Early contractor involvement improves constructability and innovation	Appropriate definition of project scope may not be known until after evaluation of proposals and (undefined areas)	
The requirements have to be defined early and need to be structured early, vs. CMGC		
The level of design in this project will allow several design alternatives to be evaluated (proper level of design)		

4) Project Cost Considerations

Project cost is the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

DESIGN-BID-BUILD Competitive bidding provides a low cost construction for a fully defined scope of work. Costs accuracy limited until design is completed. More likelihood of cost change orders due to contractor having no design responsibility.		
Opportunities	**Obstacles**	**Rating**
100% design by agency	Agency has complete control over the design (can be beneficial when there is one specific solution for a project)	-
Well-known process to the industry	Agency design errors can result in a higher number of change orders, claims, etc	
	Minimizes competitive innovation opportunities	
	Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete	
CMGC Agency/designer/contractor collaboration to reduce risk pricing can provide a low cost project however non-competitive negotiated CAP introduces price risk. Good flexibility to design to a budget.		
Opportunities	**Obstacles**	**Rating**
Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with agency, designer and contractor	Design can be used for DBB if the price is not successfully negotiated	0
Contractor involvement in early design improves constructability	Teaming and communicating concerning design can cause disputes	
Agency controls design	Three party process can slow progression of design	
Design can be responsive to risk minimization	Advanced design can limit the advantages of CMGC or could require re-design	
DESIGN-BUILD Designer-builder collaboration and ATCs can provide a cost-efficient response to project goals. Costs are determined with design-build proposal, early in design process. Allows a variable scope bid to match a fixed budget. Poor risk allocation can result in high contingencies.		
Opportunities	**Obstacles**	**Rating**
Design advanced by the agency to level necessary to precisely define the contract requirements and properly allocate risk	Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements	+
Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete)	Less agency control over the design	
Contractor involvement in early design, which improves constructability and innovation	Can create project less standardized designs across agency as a whole	
Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility		
Clearly define requirements in the RFP because it is the basis for the contract		

5) Risk Assessment of Delivery Methods

Risk is an uncertain event or condition that, if it occurs, has an effect on a project's objectives. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. An initial assessment of project risks is important to ensure the selection of the delivery method that can properly address them. An approach that focuses on a fair allocation of risk will be most successful.

DESIGN-BID-BUILD

Risk allocation for design-bid-build best is understood by the industry, but requires that most design-related risks and third party risks be resolved prior to procurement to avoid costly contractor contingency pricing, change orders, and potential claims.

Opportunities	Obstacles	Rating
Risks managed separately through design, bid, build is expected to be easier	Agency accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns	+
Risk allocation is most widely understood/used	Low-bid related risks	
Opportunity to avoid or mitigate risk through complete design	Potential for misplaced risk through prescriptive specifications	
Risks related to environmental, railroads, & third party involvement are best resolved before procurement	Innovative risk allocation is difficult to obtain	
Utilities and ROW best allocated to the agency and mostly addressed prior to procurement to minimize potential for claim	Limited industry input in contract risk allocation	
Project can be shelved while resolving risks	Change order risks can be greater	

CMGC

Provides opportunity for Agency, designer, and contractor to collectively identify and minimize project risks, and allocate risk to appropriate party. Has potential to minimize contractor contingency pricing of risk, but can lose the element of competition in pricing.

Opportunities	Obstacles	Rating
Contractor can have a better understanding of the unknown conditions as design progresses	Lack of motivation to manage small quantity costs	+
Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing)	Increase costs for non-proposal items	
Opportunities to manage costs risks through CMGC involvement	Disagreement among Designer-Contractor-Agency can put the process at risk	
Contractor will help identify and manage risk	If CAP cannot be reached, additional low-bid risks appear	
Agency still has considerable involvement with third parties to deal with risks	Strong agency management is required to negotiate/optimize risks	
Avoids low-bidding risk in procurement	Discovery of unknown conditions can drive up CAP, which can be compounded in phased construction	
More flexibility and innovation available to deal with unknowns early in the design process		

DESIGN-BUILD Provides opportunity to properly allocate risks to the party best able to manage them, but requires risks allocated to design-builder to be well defined to minimize contractor contingency pricing of risks.		
Opportunities	**Obstacles**	**Rating**
Performance specifications can allow for alternative risk allocations to the design builder	Contractor will help identify risks related to environmental, railroads, ROW, and utilities	-
Risk-reward structure can be better defined	Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders)	
Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing)	Limited time to resolve risks	
Opportunity for industry review of risk allocation (draft RFP, ATC processes)	Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract	
Avoid low-bidding risk in procurement	Risks associated with agreements when design is not completed	
	Poorly defined risks are expensive	
	Contractor may avoid risks or drive consultant to decrease cost at risk to quality	

Project Delivery Selection Matrix Secondary Factors

6) Staff Experience and Availability

Agency staff experience and availability as it relates to the project delivery methods in question.

DESIGN-BID-BUILD Technical and management resources necessary to perform the design and plan development. Resource needs can be more spread out.		
Opportunities	**Obstacles**	**Rating**
Agency, contractors and consultants have high level of experience with the traditional system		+
Designers can be more interchangeable between projects		
CMGC Strong, committed Agency project management resources are important for success of the CMGC process. Resource needs are similar to DBB except Agency must coordinate CM's input with the project designer and be prepared for CAP negotiations.		
Opportunities	**Obstacles**	**Rating**
	Strong committed agency project management is important to success	-
	Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects	
	Existing staff may need additional training to address their changing roles	
DESIGN-BUILD Technical and management resources and expertise necessary to develop the RFQ and RFP and administrate the procurement. Concurrent need for both design and construction resources to oversee the implementation.		
Opportunities	**Obstacles**	**Rating**
Less agency staff required due to the sole source nature of DB	Limitation of availability of staff with skills and knowledge to manage DB projects	0
Opportunity to grow agency staff by learning a new process	Existing staff may need additional training to address their changing roles	

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to monitor the design or construction, and amount of agency control over the delivery process

DESIGN-BID-BUILD Full control over a linear design and construction process.		
Opportunities	**Obstacles**	**Rating**
Full agency control over a linear design and construction process	Increased likelihood of claims due to agency design responsibility	+
Oversight roles are well understood		
Multiple checking points through three linear phases: design-bid-build		
Maximum control over design		
CMGC Most control by Agency over both the design, and construction, and control over a collaborative agency/designer/contractor project team		
Opportunities	**Obstacles**	**Rating**
Provides agency control over an integrated design/construction process	Preconstruction services are provided by the construction manager	-
	Higher level of cost oversight required	
DESIGN-BUILD Less control over the design (design desires must be written into the RFP contract requirements). Generally less control over the construction process (design-builder often has QA responsibilities).		
Opportunities	**Obstacles**	**Rating**
Obtaining input from the Design-Builder to enhance constructability and innovation	A single entity responsibility during project design and construction	-
Overall project planning and scheduling is established by one entity	Limitation on staff with DB oversight experience	
	Less agency control over design	
	Control over design relies on proper development of technical requirements	

8) Competition and Contractor Experience

Competition and availability refers to the level of competition, experience and availability in the market place and its capacity for the project.

DESIGN-BID-BUILD High level of competition, but GC selection is based solely on low price. High level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**
Promotes high level of competition in the marketplace	Risks associated with selecting the low bid (the best contractor is not necessary selected)	+
Opens construction to all reasonably qualified bidders	No contractor input into the process	
Transparency and fairness	Limited ability to select contractor based on qualifications	
Reduced chance of corruption and collusion		
Contractors are familiar with the DBB process		
CMGC Allows for the selection of the single most qualified contractor, but CAP can limit price competition. Low level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**
Allows for qualifications based contractor procurement	Working with only one contractor to develop the CAP can limit price competition	0
Agency has control over an independent selection of best qualified designer and contractor	Requires a strong project manager from the agency	
DESIGN-BUILD Allows for a balance of price and non-price factors in the selection process. Medium level of marketplace experience.		
Opportunities	**Obstacles**	**Rating**
Allows for a balance of qualifications and cost in design-builder procurement	The gap between agency experience and contractor experience with delivery method can create conflict	+
Two-phase process can promote strong teaming to obtain “Best Value”		
Increased opportunity for innovation possibilities due to the diverse project team		

Project Delivery Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Project Complexity and Innovation Project Delivery Selection Checklist

DESIGN-BID-BUILD –
Complexity and Innovation Considerations
• Agencies control of design of complex projects + (may not get a lot of innovation) • Agency and consultant expertise can select innovation independently of contractor abilities – (Contractor input is key to innovation) • Opportunities for value engineering studies during design, more time for design solutions **+** • Aids in consistency and maintainability **++** (limits construction of items CDOT may not be able to maintain) • Full control in selection of design expertise **+** • Complex design can be resolved and competitively bid – (complex design creates potential more missed items) • Innovations can add cost or time and restrain contractor's benefits – (innovations could result in re-work extending the schedule) • No contractor input to optimize costs – – • Limited flexibility for integrated design and construction solutions (limited to constructability) – • Difficult to assess construction time and cost due to innovation – • **5+, 7-**
CMGC 0
Complexity and Innovation Considerations
• Highly innovative process through 3 party collaboration + • Allows for agency control of a designer/contractor process for developing innovative solutions + (designer reports to CDOT not the contractor) • Allows for an independent selection of the best qualified designer and best qualified contractor + • VE inherent in process and enhanced constructability 0/– (experience is that VE is not as inherent as theory) • Risk of innovation can be better defined and minimized and allocated + • Can take to market for bidding as contingency 0 (has not occurred within CDOT yet, and adds time to schedule) • Can develop means and methods to the strengths of a single contractor partner throughout preconstruction 0 • Process depends on designer/CM relationship – (team is formed by separately selecting designer and contractor) • No contractual relationship between designer/CM – • Innovations can add or reduce cost or time 0 • Management of scope additions – (Since a complete set of plans is required, scope changes could result in significant time for re-work) • **4+, 4-0, 4-**
DESIGN-BUILD +
Complexity and Innovation Considerations
• Designer and contractor collaborate to optimize means and methods and enhance innovation ++ • Opportunity for innovation through competiveness of ATC process ++ • Can use best-value procurement to select design-builder with best qualifications + • Constructability and VE inherent in process ++ • Early team integration + • Requires desired solutions to complex designs to be well defined through technical requirements – (developing tech reqts difficult to manage both design and construction) • Qualitative designs can be difficult to define if not done early in design (example. aesthetics) – (Poudre, Kendall Parkway Park-n-Ride, Centurra) • time or cost constraints on designer – (may not be motivated to provide the best solution for CDOT) • Quality assurance for innovative processes can be difficult to define in RFP 0 (in many cases the contractor checks their own work with independent quality audits) • Ability to obtain intellectual property through the use of stipends + (CDOT can keep all the ideas from all unsuccessful teams if those teams collect the stipend) • **9+, 1-0, 3-**

2) Delivery Schedule Project Delivery Selection Checklist

DESIGN-BID-BUILD 0
Schedule Considerations
• Schedule is more predictable and more manageable 0 (the schedule is predictable but not optimized based on contractors capabilities) • Milestones can be easier to define 0 (milestones can be defined, however, not as reliable without contractor input) • Projects can more easily be "shelved" + • Shortest procurement period + (given the timing of this project) • Elements of design can be advanced prior to permitting, construction, etc. + • Time to communicate/discuss design with stakeholders + • Time to perform a linear Design-Bid-Build delivery process – (Design would have to wait until funding is in place) • Design and construction schedules can be unrealistic due to lack of industry input – • Errors in design lead to change orders and schedule delays – • Low bid selection may lead to potential delays and other adverse outcomes. – • **4+, 2-0, 4-**
CMGC 0
Schedule Considerations
• Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) + (ability to do phased packages) • More efficient procurement of long-lead items 0 (Not an issue on this project, most items are readily available) • Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) 0 (neutral in comparison to DB as we will be doing this during the procurement process) • Can provide a shorter procurement schedule than DB 0 (purely selection of a contractor is fast, however, negotiation of GMP and pricing can be drawn out) • Team involvement for schedule optimization + (earlier engagement of contractor for discussion of phasing) • Continuous constructability review and VE 0 (theory is accurate, recent experience has shown this is can be challenging to achieve) • Maintenance of Traffic improves with contractor inputs + • Contractor input for phasing, constructability and traffic control may reduce overall schedule + • Potential for not reaching CAP and substantially delaying schedule – (project would have to be put out for bid) • CAP negotiation can delay the schedule – • Designer-contractor-agency disagreements can add delays – • Strong agency management is required to control schedule – • **4+, 4-0, 4-**
DESIGN-BUILD +
Schedule Considerations
• Potential to accelerate schedule through parallel design-build process + (Development of base configuration is flexible while funding is finalized and can advertise project much sooner than other delivery methods) • Shifting of schedule risk 0 (neutral because the construction schedule will be dictated) • Industry input into design and schedule + • Fewer chances for disputes between agency and the Design-Build team + • More efficient procurement of long-lead items 0 • Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) + • Allows innovation in resource loading and scheduling by DB team ++ • Request for proposal development and procurement can be intensive • Undefined events or conditions found after procurement, but during design can impact schedule and cost - • Time required to define and develop RFP technical requirements and expectations 0 (teams are already engaged) • Requires agency and stakeholder commitments to an expeditious review of design – (railroads, communities, utilities will require thoughtful attention) • **6+, 3-0, 3-**

3) Project Cost Considerations Project Delivery Selection Checklist

DESIGN-BID-BUILD –
Project Cost Considerations
• Competitive bidding provides a low cost construction to a fully defined scope of work + • Increased certainty about cost estimates 0 • Construction costs are contractually set before construction begins + • Cost accuracy is limited until design is completed – • Construction costs are not locked in until design is 100% complete – (similar to one previous) • Cost reductions due to contractor innovation and constructability is difficult to obtain 0 (There is a VE process, but contractors may not be interested unless there is a huge savings) • More potential of cost change orders due to Agency design responsibility – (due to complexity, higher potential for changed conditions) • **2+, 2-0, 3-**
CMGC +
Project Cost Considerations
• Agency/designer/contractor collaboration to reduce project risk can result in lowest project costs 0 (experience does not show this) • Early contractor involvement can result in cost savings through VE and constructability + • Cost will be known earlier when compared to DBB 0 (GMP is not completed until near the end of the design, so only saves the time to bid the project) • Integrated design/construction process can provide a cost efficient strategies to meet project goals + • Can provide a cost efficient response to meet project goals + • Non-competitive negotiated CAP introduces price risk -- (contractor may not be motivated to give his best price or minimize overall quantities) • Difficulty in CAP negotiation introduces some risk that CAP will not be successfully executed requiring aborting the CMGC process 0 (Although possible, has not happened yet) • Paying for contractors involvement in the design phase could potentially increase total cost 0 • Use of Independent Cost Estimating (ICE) expertise to obtain competitive pricing during CAP negotiations 0 (helpful but not seeing as much value) • **3+, 5-0, 2-**
DESIGN-BUILD +
Project Cost Considerations
• Contractor input into design should ~~(moderate cost)~~ maximize scope ++ (criteria updated to match goals) • Design-builder collaboration and ATCs can provide a cost-efficient response to project goals + • Costs are contractually set early in design process with design-build proposal + • Allows a variable scope bid to match a fixed budget ++ (lesser level of design requires less re-work to make changes) • Potential lower average cost growth 0 (minimizes scope creep) • Funding can be obligated in a very short timeframe 0 (not strongly schedule driven) • Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project – • **6+, 2-0, 1-**

4) Level of Design Project Delivery Selection Checklist

DESIGN-BID-BUILD –
Level of Design Considerations
• 100% design by agency + • Agency has complete control over the design (can be beneficial when there is one specific solution for a project) – (multiple optimized solutions are possible, therefore having contractor input from 3 teams would maximize value) • Project/scope can be developed through design 0 (scope is known) • The scope of the project is well defined through complete plans and contract documents 0 (project can be defined through procurement documents) • Well-known process to the industry + • Agency design errors can result in a higher number of change orders, claims, etc. – • Minimizes competitive innovation opportunities – – • Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete – • **2+, 2-0, 5-**
CMGC 0
Level of Design Considerations
• Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with agency, designer and contractor + • Contractor involvement in early design improves constructability + • Agency controls design + • Design can be used for DBB if the price is not successfully negotiated – (requires schedule and potential cost uncertainty) • Design can be responsive to risk minimization + • Teaming and communicating concerning design can cause disputes – (designer and contractor did not choose to team, but were chosen separately) • Three party process can slow progression of design – • Advanced design can limit the advantages of CMGC or could require re-design – • **4+, 4-**
DESIGN-BUILD +
Level of Design Considerations
• Design advanced by the agency to level necessary to precisely define the contract requirements and properly allocate risk + (the owner only advances the design far enough to make informed decisions) • Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) + • Contractor involvement in early design, which improves constructability and innovation ++ • Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility + • Clearly define requirements in the RFP because it is the basis for the contract + (this process forces you to define the requirements early and structure it vs. CMGC) • If design is too far advanced it will limit the advantages of design-build 0 (the approach being used for the project allows design alternatives) • Carefully develop the RFP so that scope is fully defined 0 (scope in areas of innovation will be determined in the procurement process) • Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements **-** (Need to work with technical groups to limit restrictions and allow for innovation) • Less agency control over the design **-** (completed by DB team per the technical requirements, changes would cause change orders) • Can create project less standardized designs across agency as a whole – (different innovations across projects) • **6+, 2-0, 3-**

5a) Initial Risk Assessment Guidance

Three sets of risk assessment checklists are provided to assist in an initial risk assessment relative to the selection of the delivery method:

- Typical Transportation Project Risks
- General Project Risks Checklist
- Opportunities/Obstacles Checklist (relative to each delivery method)

It is important to recognize that the initial risk assessment is to only ensure the selected delivery method can properly address the project risks. A more detailed level of risk assessment should be performed concurrently with the development of the procurement documents to ensure that project risks are properly allocated, managed, and minimized through the procurement and implementation of the project.

The following is a list of project risks that are frequently encountered on transportation projects and a discussion on how the risks are resolved through the different delivery methods.

1) Site Conditions and Investigations

How unknown site conditions are resolved. For additional information on site conditions, refer to 23 CFR 635.109(a) at the following link: http://ecfr.gpoaccess.gov/

DESIGN-BID-BUILD + Site condition risks are generally best identified and mitigated during the design process prior to procurement to minimize the potential for change orders and claims when the schedule allows.
CMGC ++ CDOT, the designer, and the contractor can collectively assess site condition risks, identify the need to perform site investigations in order to reduce risks, and properly allocate risk prior to CAP.
DESIGN-BUILD 0 Certain site condition responsibilities can be allocated to the design-builder provided they are well defined and associated third party approval processes are well defined. Caution should be used as unreasonable allocation of site condition risk will result in high contingencies during bidding. The Agency should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum, the Agency should perform the following investigations: 1) Basic design surveys 2) Hazardous materials investigations to characterize the nature of soil and groundwater contamination 3) Geotechnical baseline report to allow design-builders to perform proposal design without extensive additional geotechnical investigations

2) Utilities

DESIGN-BID-BUILD + Utility risks are best allocated to the Agency, and mostly addressed prior to procurement to minimize potential for claims when the schedule allows.
CMGC + Can utilize a lower level of design prior to contracting and joint collaboration of Agency, designer, and contractor in the further development of the design.
DESIGN-BUILD - Utilities responsibilities need to be clearly defined in contract requirements, and appropriately allocated to both design-builder and the Agency: *Private utilities (major electrical, gas, communication transmission facilities*): Need to define coordination and schedule risks, as they are difficult for design-builder to price. Best to have utilities agreements before procurement. Note – by state regulation, private utilities have schedule liability in design-build projects, but they need to be made aware of their responsibilities. *Public Utilities:* Design and construction risks can be allocated to the design-builder, if properly incorporated into the contract requirements.

3) Railroads (if applicable)

DESIGN-BID-BUILD ++ Railroad risks are best resolved prior to procurement and relocation designs included in the project requirements when the schedule allows.
CMGC + Railroad impacts and processes can be resolved collaboratively by Agency, designer, and contractor. A lengthy resolution process can delay the CAP negotiations.
DESIGN-BUILD 0 Railroad coordination and schedule risks should be well understood to be properly allocated and are often best assumed by the Agency. Railroad design risks can be allocated to the designer if well defined. Best to obtain an agreement with railroad defining responsibilities prior to procurement

4) Drainage/Water Quality Best Management Practices (construction and permanent)

Both drainage and water quality often involve third party coordination that needs to be carefully assessed with regard to risk allocation. Water quality in particular is not currently well defined, complicating the development of technical requirements for projects.

Important questions to assess:

1) Do criteria exist for compatibility with third party offsite system (such as an OSP (Outfall System Plan))?

2) Is there an existing cross-drainage undersized by design Criteria?

3) Can water quality requirements be precisely defined? Is right-of-way adequate?

DESIGN-BID-BUILD ++ Drainage and water quality risks are best designed prior to procurement to minimize potential for claims when the schedule allows.
CMGC ++ The Agency, the designer, and the contractor can collectively assess drainage risks and coordination and approval requirements, and minimize and define requirements and allocate risks prior to CAP.
DESIGN-BUILD 0 Generally, the Agency is in the best position to manage the risks associated with third party approvals regarding compatibility with offsite systems, and should pursue agreements to define requirements for the design-builder.

5) Environmental

Meeting environmental document commitments and requirements, noise, 4(f) and historic, wetlands, endangered species, etc.

DESIGN-BID-BUILD ++ Risk is best mitigated through design prior to procurement when the schedule allows.
CMGC + Environmental risks and responsibilities can be collectively identified, minimized, and allocated by the Agency, the designer, and the contractor prior to CAP
DESIGN-BUILD - Certain environmental approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

6) Third Party Involvement

Timeliness and impact of third party involvement (funding partners, adjacent municipalities, adjacent property owners, project stakeholders, FHWA, PUC, FEMA in this case)

DESIGN-BID-BUILD + Third party risk is best mitigated through design process prior to procurement to minimize potential for change orders and claims when the schedule allows.
CMGC + Third party approvals can be resolved collaboratively by the Agency, designer, and contractor.
DESIGN-BUILD 0 Third party approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

5b) General Project Risk Checklist (Items to consider when assessing risk)

Environmental Risks	External Risks
• Delay in review of environmental documentation • Challenge in appropriate environmental documentation • Defined and non-defined hazardous waste • Environmental regulation changes • Environmental impact statement (EIS) required • NEPA/ 404 Merger Process required • Environmental analysis on new alignments required	• Stakeholders request late changes • Influential stakeholders request additional needs to serve their own commercial purposes • Local communities pose objections • Community relations • Conformance with regulations/guidelines/ design criteria • Intergovernmental agreements and jurisdiction
Third-Party Risks	**Geotechnical and Hazmat Risks**
• Unforeseen delays due to utility owner and third-party • Encounter unexpected utilities during construction • Cost sharing with utilities not as planned • Utility integration with project not as planned • Third-party delays during construction • Coordination with other projects • Coordination with other government agencies	• Unexpected geotechnical issues • Surveys late and/or in error • Hazardous waste site analysis incomplete or in error • Inadequate geotechnical investigations • Adverse groundwater conditions • Other general geotechnical risks
Right-of-Way/ Real Estate Risks	**Design Risks**
• Railroad involvement • Objections to ROW appraisal take more time and/or money • Excessive relocation or demolition • Acquisition ROW problems • Difficult or additional condemnation • Accelerating pace of development in project corridor • Additional ROW purchase due to alignment change	• Design is incomplete/ Design exceptions • Scope definition is poor or incomplete • Project purpose and need are poorly defined • Communication breakdown with project team • Pressure to delivery project on an accelerated schedule • Constructability of design issues • Project complexity - scope, schedule, objectives, cost, and deliverables - are not clearly understood
Organizational Risks	**Construction Risks**
• Inexperienced staff assigned • Losing critical staff at crucial point of the project • Functional units not available or overloaded • No control over staff priorities • Lack of coordination/ communication • Local agency issues • Internal red tape causes delay getting approvals, decisions • Too many projects/ new priority project inserted into program	• Pressure to delivery project on an accelerated schedule. • Inaccurate contract time estimates • Construction QC/QA issues • Unclear contract documents • Problem with construction sequencing/ staging/ phasing • Maintenance of Traffic/ Work Zone Traffic Control

5c) Assessment of Risk Project Delivery Selection Opportunities/Obstacles Checklist

DESIGN-BID-BUILD +
Risk Considerations
• Risks managed separately through design, bid, build is expected to be easier + (more control over risks) • Risk allocation is most widely understood/used + • Opportunity to avoid or mitigate risk through complete design ++ • Risks related to environmental, railroads, & third party involvement are best resolved before procurement + • Utilities and ROW best allocated to the agency and mostly addressed prior to procurement to minimize potential for claim ++ • Project can be shelved while resolving risks + • Agency accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns – • Low-bid related risks – (contractor not chosen on qualifications) • Potential for misplaced risk through prescriptive specifications – (vs. performance based specs) • Innovative risk allocation is difficult to obtain – (process is rigid) • Limited industry input in contract risk allocation – • Change order risks can be greater – • 8+,6-
CMGC +
Risk Considerations
• Contractor can have a better understanding of the unknown conditions as design progresses ++ • Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) + • Opportunities to manage costs risks through CMGC involvement + • Contractor will help identify and manage risk ++ • Agency still has considerable involvement with third parties to deal with risks + • Avoids low-bidding risk in procurement + • More flexibility and innovation available to deal with unknowns early in the design process + • Lack of motivation to manage small quantity costs – • Increase costs for non-proposal items – – (change orders more expensive) • Disagreement among Designer-Contractor-Agency can put the process at risk – • If CAP cannot be reached, additional low-bid risks appear – • Limited to risk capabilities of CMGC 0 • Strong agency management is required to negotiate/optimize risks – • Discovery of unknown conditions can drive up CAP, which can be compounded in phased construction – • 9+, 1-0, 7-

DESIGN-BUILD –
Risk Considerations
• Performance specifications can allow for alternative risk allocations to the design builder + • Risk-reward structure can be better defined + • Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) + • Opportunity for industry review of risk allocation (draft RFP, ATC processes) + • Avoid low-bidding risk in procurement + (quals based shortlist) • Contractor will help identify risks related to environmental, railroads, ROW, and utilities + • Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns 0 (Few unknowns expected) • Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders) – • Limited time to resolve risks – • Additional risks allocated to designers for errors and omissions, claims for change orders 0 • Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract – • Risks associated with agreements when design is not completed – • Poorly defined risks are expensive – – • Contractor may avoid risks or drive consultant to decrease cost at risk to quality – • 6 +, 2-0, 7-

6) Staff Experience and Availability Project Delivery Selection Checklist

DESIGN-BID-BUILD +
Staff Experience and Availability Considerations
• Agency, contractors and consultants have high level of experience with the traditional system ++ • Designers can be more interchangeable between projects + • Can require a high level of agency staffing of technical resources – • Staff's responsibilities are spread out over a longer design period 0 • Can require staff to have full breadth of technical expertise 0 (CDOT has the technical expertise) • 3+, 2-0, 1-
CMGC –
Staff Experience and Availability Considerations
• Agency can improve efficiencies by having more project managers on staff rather than specialized experts 0(-) • Smaller number of technical staff required through use of consultant designer 0 • Strong committed agency project management is important to success – • Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects – • Existing staff may need additional training to address their changing roles – • Agency must learn how to negotiate CAP projects 0(-) • 0+, 3-0, 4-
DESIGN-BUILD 0
Staff Experience and Availability Considerations
• Less agency staff required due to the sole source nature of DB + • Opportunity to grow agency staff by learning a new process + • Limitation of availability of staff with skills and knowledge to manage DB projects – • Existing staff may need additional training to address their changing roles – • Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.) 0 • 2+, 1-0, 2-

7) Level of Oversight and Control Project Delivery Selection Checklist

DESIGN-BID-BUILD +
Level of Oversight and Control Considerations
• Full agency control over a linear design and construction process + • Oversight roles are well understood ++ • Contract documents are typically completed in a single package before construction begins 0 • Multiple checking points through three linear phases: design-bid-build + • Maximum control over design + • Requires a high-level of oversight 0 (CDOT is experienced in the oversight) • Increased likelihood of claims due to agency design responsibility – • Limited control over an integrated design/construction process. 0 • 5+, 3-0, 1-
CMGC -
Level of Oversight and Control Considerations
• Preconstruction services are provided by the construction manager – (no clear vision now) • Obtaining input from the CMGC to enhance constructability and innovation 0 • Provides agency control over an integrated design/construction process + • Agency must have experienced staff to oversee the CMGC 0 (Staff has some recent experience) • Higher level of cost oversight required – • 1+, 2-0, 2-
DESIGN-BUILD –
Level of Oversight and Control Considerations
• A single entity responsibility during project design and construction – • Obtaining input from the Design-Builder to enhance constructability and innovation + • Overall project planning and scheduling is established by one entity + • Can require a high level of design oversight 0 (Staff available) • Can require a high level of quality assurance oversight 0 (less than other methods) • Limitation on staff with DB oversight experience - • Less agency control over design – • Control over design relies on proper development of technical requirements – • 2+, 2-0, 4-

8) Competition and Contractor Experience Project Delivery Selection Checklist

DESIGN-BID-BUILD +
Competition and Contractor Experience Considerations
• Promotes high level of competition in the marketplace + • Opens construction to all reasonably qualified bidders + • Transparency and fairness + • Reduced chance of corruption and collusion + • Contractors are familiar with the DBB process ++ • Risks associated with selecting the low bid – (the best contractor is not necessary selected) • No contractor input into the process – • Limited ability to select contractor based on qualifications – • 6+, 3-
CMGC 0
Competition and Contractor Experience Considerations
• Allows for qualifications based contractor procurement + • Agency has control over an independent selection of best qualified designer and contractor ++ • Contractor is part of the project team early on, creating a project "team" 0 (may or may not be successful) • Increased opportunity for innovation due to the diversity of the project team 0 • Currently there is not a large pool of contractors with experience in CMGC, which will reduce the competition and availability 0 (there is currently a large enough pool) • Working with only one contractor to develop the CAP can limit price competition – – • Requires a strong project manager from the agency – • Teamwork and communication among the project team 0 (may or may not be successful) • 3+, 4-0, 3-
DESIGN-BUILD +
Competition and Contractor Experience Considerations
• Allows for a balance of qualifications and cost in design-builder procurement + • Two-phase process can promote strong teaming to obtain "Best Value" + • Increased opportunity for innovation possibilities due to the diverse project team + • Need for DB qualifications can limit competition 0 (there is currently a large enough pool of contractors that know the process) • Lack of competition with past experience with the project delivery method 0 (there is currently a large enough pool of contractors that know the process) • Reliant on DB team selected for the project 0 • The gap between agency experience and contractor experience with delivery method can create conflict – • 3+, 3-0,1-