COLORADO
Department of Transportation

Region Four
10601 West 10th Street
Greeley, CO 80634

DATE: August 31, 2020

TO: Stephen Harelson, P.E., Chief Engineer
Matthew Pacheco, P.E., Alternative Delivery Program Manager

FROM: Keith Wakefield, P.E., Region 4 Loveland Residency
Justin Pipe, P.E., Region 4 Loveland Resident Engineer JP

SUBJECT: Design Decision, Alternate Project Delivery Method Recommendation
Project No. NH 2873-141 (15147), US 287 Relocation (NISP)

BACKGROUND:

More than a decade ago, Northern Colorado Water Conservany District (Northern Water) began looking at the feasibility of building Glade Reservoir on the existing US 287 alignment (MP 352.55 to 361.97) as part of the Northern Irrigation Supply Project (NISP). As a result of the study, it was determined the relocation of US 287 would be a key component for the construction of the new reservoir. The relocation of US 287 is 100% funded through Northern Water as a replace-in-kind roadway with improvements up to current standards. CDOT was considered a cooperating agency in the development of the Environmental Impact Study (EIS) with the Army Corps of Engineers being the lead federal agency for the project.

The EIS process for NISP is now entering the final steps in order to receive the record of decision (ROD). Design efforts have recently ramped up in order to meet the new schedule with a floating start of construction in fall 2023.

Northern Water proposed looking into alternative delivery methods for the construction of the new US 287 alignment in order to help achieve the project's goals. CDOT proposed utilizing the CDOT Project Delivery Selection Matrix (PDSM) to evaluate alternative delivery methods for this project. Design-Bid-Build (DBB), Design-Build (DB), and Construction Manager/General Contractor (CM/GC) methods were considered. At this time, it is uncertain if CDOT or Northern Water will be the contracting agency for construction.

ANALYSIS:

The relocation of US 287 is a key component for the construction of the larger Glade Reservoir construction project. Any delays to the roadway relocation could result in large liquidated damages to Northern Water as a result of delaying the Glade Reservoir project. In addition, the date of Notice to Proceed is uncertain, as it relies on various approvals. Scheduling the work in an efficient manner will be critical for the overall success of the reservoir.

There are other risks associated with the chosen alignment which could lead to delays in construction. There is a large rock cut-in as a probable paleontology concern, a significant embankment fill section in unfavorable soil conditions, and a bridge within the significant fill section. It is critical for these risks to be be mitigated prior to or during construction in order to prevent a schedule delay.

The current level of design is between 30% and 50%, depending on the design specialty areas. This allows opportunities for innovation within the phasing of work, utility and ROW coordination and risk mitigation during the design phase.

The workshop participants agreed that Design Build (DB) had a fatal flaw due to the current level of design being too far advanced and thus, limiting innovation within the DB process. There is still a lot of investigative work, coordination and unknown milestones to be able to capture within a current proposed scope of work for the project.

The workshop participants then focused on Design-Bid-Build and CM/GC contracting methods.

RECOMMENDATION:

Based upon the findings of the the workshop, participants recommend a CM/GC Project Delivery Method. The justification includes:

- Early contractor involvement with construction phasing and developing contingency plans are critical to the success of the project
- Risk register can be utilized to mitigate risks and prevent delays during construction
- Contractor chosen based on qualifications specific to the complexities of the project
- Early investigative construction packages can be utilized to collect data necessary to mitigate risk/delays during construction
- Project Team collaboration can result in early cost certainty and the independent cost estimators can help determine price reasonableness
- Easy to add/revise scope as design and coordination efforts progress

The Project Team does not recommend DBB, as input from the contractor for the schedule and pricing will not be available, in addition to the high delay risks associated with errors and omissions in the contract. Your consideration and concurrence are greatly appreciated.

I concur with this design decision:

_____

Matthew Pacheco, P.E., Alternative Delivery Program Manager

_____

Steven Harelson, P.E., Chief Engineer

NPE:mbc
cc: S. Harelson
M. Pacheco
Heather Paddock, P.E., R4 Transportation Director HNP
James Usher, P.E., R4 North Program Engineer
Keith Wakefield, P.E., R4 Project Engineer
Justin Pipe, P.E., R4 Loveland Resident Engineer

Project Delivery Selection Workshop Summary (MAY 2019 VERSION)

Workshop Summary	
Project Name:	US 287 Relocation (NISP)
Workshop Date:	April 23, 2020
Workshop Location:	Virtual
Facilitator:	Keith Wakefield
Delivery Method Selected:	CMGC

Workshop Participants	
Name	**Email**
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Gray Clark	gclark@mullereng.com
Justin Pipe	Justin.pipe@state.co.us
Alternative Project Delivery representative.	
HPTE representative if necessary.	

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: US 287 Relocation (NISP)
Location: US 287 MP 352.55 to 361.97
Estimated Budget: $80,000,000.00 to 120,000,000.00
Estimated Project Delivery Period: From NTP until Reservoir switch – 2 Year Period
Required Delivery Date (if applicable): Not known at this time
Source(s) of Project Funding: Northern Water
Project Corridor: US 287C
Major Features of Work – pavement, bridge, sound barriers, etc.: 7 miles of virgin alignment, rock cut, bridge, fill sections, intersections, CBC's
Major Schedule Milestones: 2 year from NTP
Major Project Stakeholders: Northern Water, Larimer County, CDOT, Poudre Canal, Utilities, Army Corp of Engineers
Major General Obstacles: Rock cut, large fill, structures, phasing
Major Obstacles with Right of Way, Utilities, and/or Environmental Approvals: ROW on Northern Water, Utilities-Power, Environmental-EIS
Major Obstacles during Construction Phase: Phasing, cut and fill sections, structures
Safety Issues: Rock Excavation-Blasting, Heavy equipment haul
Sustainable Design and Construction Requirements: N/A

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: Meet deadline to not cause delays to reservoir construction
Goal #2: Inspire innovation to provide a high quality product that minimizes long-term maintenance concerns
Goal #3: Efficiently phase the project to minimize costs
Goal #4: Deliver a the project in a safe manner that is compliant with laws and standards

General Project Goals (For reference)

Schedule

- Minimize project delivery time
- Complete the project on schedule
- Accelerate start of project revenue

Cost

- Minimize project cost
- Maximize project budget
- Complete the project on budget
- Maximize the project scope and improvements within the project budget

Quality

- Meet or exceed project requirements
- Select the best team
- Provide a high quality design and construction constraints
- Provide an aesthetically pleasing project

Functional

- Maximize the life cycle performance of the project
- Maximize capacity and mobility improvements
- Minimize inconvenience to the traveling public during construction
- Maximize safety of workers and traveling public during construction

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: Northern Water
Schedule constraints: 2 years from NTP
Federal, state, and local laws: NEPA, FHWA Coordination, Army Corp of Engineers, State Standards, Larimer County
Third party agreements with railroads, ROW, etc.: Ditch agreements, ROW, IGA with Northern Water, Utility Agreements, Larimer County Road Coordination and Access Agreements
Project Financing
Does your project have any funding gaps that would require Financing*? No
Project Delivery Specific Constraints
Project delivery constraint #1: Switch traffic by the date necessary to prevent delays on the reservoir
Project delivery constraint #2: Project cost has to be approved by Northern Water
Project delivery constraint #3: Must adhere to standards proposed by CDOT
Project delivery constraint #4: No known project start date

General Project Constraints

Schedule

- Utilize federal funding by a certain date
- Complete the project on schedule
- Weather and/or environmental impact

Cost

- Project must not exceed a specific amount
- Minimal changes will be accepted
- Some funding may be utilized for specific type of work (bridges, drainage, etc.)
- *If project financing is required before proceeding with the project delivery selection matrix, the project will need to coordinate with the Colorado High Performance Transportation Enterprise (HPTE). If financing is necessary, the project will need to work with the HPTE to determine the appropriate project delivery method that will accommodate the financing mechanism(s).

Quality

- Must adhere to standards proposed by the Agency
- High quality design and construction constraints

- Adhere to local and federal codes

Functional

- Traveling public must not be disrupted during construction
- Hazardous site where safety is a concern
- Return area surrounding project to existing conditions

Project Risks

Identified Project Risks
Project Risk: Meeting schedule requirements
Project Risk: Rock cut in probable paleontology area
Project Risk: Significant fill section
Project Risk: Bridge within significant fill section
Project Risk: Physical Constructability of project
Project Risk: Northern Water and CDOT coordination
Project Risk: Utility relocations

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

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

Project Delivery Selection Summary Conclusions and Comments

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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
Allows designer to look at a wider variety of alternatives before contractor is involved	Lack of contractor involvement in design	-
Traditional delivery method, no learning curve	Inability to qualify contractors	
Maximum control of design and project elements	Cannot build as designed (if there are fatal flaws)	
	Potential for a dispute (design error, etc.)	

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
Phasing with contractor involvement	Learning Curve for Contracting Method	++
Rock cut means and methods	Can require a lot of management and partnership, extra layer of communication	
Testing investigation construction package to help aid design		
Precast lead time coordination		
Select contractor based on complexities of project		

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
		N/A

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
Time to complete process	Delays or field revisions could result in failing to meet project milestones	-
Project is bid once all approvals have been made / Contractor is not waiting on approvals to proceed	CMOs could add additional contract time	
	No schedule certainty	

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
Mitigate Schedule Risk	Does not work well with drop dead dates	++
Longer time for contractor to plan work	Multiple Alternatives- Could create more testing investigative work (Increase duration)	
Mobilize Quicker	Delayed NTP could result into longer preconstruction phase and possibly loss of key contractor personnel	
Expedite getting contractor started once NTP is given		
Schedule Certainty		

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
		N/A

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
We have 30-50% Design Complete	Utility Coordination	++
Alignment is decided upon	Less integration between design and construction	
ROW are in development		

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
Still have opportunity to change major portions of project	We have 30-50% design	-
We are at a phase where a constructability review is necessary to progress design	Alignment is decided upon	
Opportunity to phase utility relocations with work	ROW are in development	

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
	*Fatal Flaw Design is between 30 % and 50 % complete	X

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
Value in competition-Low bid	Possibility of unqualified contractor	+
	Cost certainty	
	Harder to control LD's not completing on time	
	Difficult to get good bids from contractors	

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
Real time cost	Addition CM Cost	++
Multiple cost iteration	Possible redesign costs	
Control schedule costs	Subcontractor pricing	
Shared risk pool	Lowers negotiation ability with a fixed date	
ICE involvement throughout the design process	Not coming to an agreed upon price	
	Independent Cost Estimator Costs	

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
		N/A

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
Risk can be built into unit price	CDOT and Northern Water take on Risk	-
	Insuring a highly qualified contractor	
	Delay time to assess risk once triggered	

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
Risk register to identify and mitigate risk	Risk reserve funds are difficult to transfer between phases	++
Risk share		
Retire risk in the design phase		

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