COLORADO BRIDGE ENTERPRISE
Memorandum

Colorado Bridge Enterprise
4201 East Arkansas Avenue
Denver, Colorado 80222

DATE: May 3, 2013

TO: Bridge Enterprise Board of Directors

FROM: Tim Harris, CBE Chief Engineer
Josh Laipply, CDOT Bridge Engineer

SUBJECT: Bridge Prioritization Plan Update

BRIDGE ENTERPRISE WORKSHOP

The workshop will provide the CBE Board of Directors with an update regarding the development and implementation of the Bridge Prioritization Plan.

The Prioritization Plan serves as an objective scoring system whereas both quantitative and qualitative criteria are taken into consideration to determine which FASTER eligible bridge(s) represent the best use of available funding. All current un-programmed bridges and future FASTER eligible bridges will be scored and assigned a numerical value (or ranking) that can be compared to each other to ensure that available funding is being applied to the most relevant structure.

The workshop shall address the following topics:

- Survey questionnaire and survey data results.
- Establishment of scoring worksheet and associated weighting of major-criteria and sub-criteria.
- Development of the Prioritization Plan Logic Summary and corresponding selection workflow diagram.
- Testing of the scoring worksheet using current FASTER eligible bridges to ensure that criteria weighting system is advancing structures commensurate with expected results.
- Review of sample test results.
- Reclassification of current un-programmed bridges.

In support of this workshop, the following attached documents shall be reviewed:

- Prioritization Plan Logic summary
- Survey data results
- Scoring worksheet and scoring criteria weighting breakdown
- Selection workflow diagram
- Sample test results

Colorado Bridge Enterprise

Prioritization Plan - Logic Summary

April 23, 2013

Introduction

The Prioritization Plan is a tool to aid decision-makers in establishing which projects are best suited to be programmed by meeting CDOT's and Bridge Enterprise's goals. The process is a means to help generally prioritize and rank structures in order of importance based on the quantitative and qualitative factors. The prioritization plan converts these factors for each structure to weighted numerical values. The combination of factors will determine a final score for each structure. These scores rank structures in the program in a consistent method and help the Bridge Enterprise allocate resources in a more effective, transparent manner.

Definitions

Bridge Designation:

- Structurally Deficient is used to describe a bridge that has one or more structural defects that require attention.
- Functionally Obsolete is used to describe a bridge that is no longer compliant by design to the current code. Examples of functionally obsolete include: not having enough lanes to accommodate traffic flow, inadequate shoulder width, etc.

Sufficiency Rating: Bridge sufficiency is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value that is indicative of a bridge's ability (sufficiency) to remain in service. The four factors include: structural adequacy and safety, serviceability and functional obsolescence, essentiality for public use and special reductions. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge. The lower the sufficiency rating the higher the prioritization plan score.

Bridge or Structural Condition: This section examines the condition rating of different structure components. An element receives a high prioritization value if the structure is posted for reduced capacity, has insufficient vertical clearance, and/or the condition rating is considered poor or worse, or receives a score less than or equal to 4 on the Structure Inspection and Inventory Report (SIA report).

Average Daily Traffic (ADT): ADT is defined as the average number of bidirectional vehicles passing on a specific bridge in a 24-hour period. The higher the ADT is on the structure, the higher the prioritization score.

Percent Truck Traffic (%TT): The %TT definition is simply the percentage value that shows the percentage of average daily traffic that is truck traffic. The higher the %TT is on the structure, the higher the prioritization score.

Bridge Importance: This section highlights the type of traffic the structure carries, its importance locally and within the region, designation on the National Highway System (NHS) or historical standing. The structure can be more than one of the sub-criterion listed in this section.

- The NHS as defined by the Federal Highway Administration (FHWA) as the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility.
- Primary access to a local community will be determined by the length of detour needed during construction.
- Economic strategic corridor is defined as a corridor that is deemed important to movement of freight, tourism, agriculture, oil and gas, etc. and is officially designated by the CDOT Division of Transportation Development (DTD) office.
- Historical significance is determined if the structure is on the Historic Bridge List or candidate.
- Significant pedestrian or bike crossing is determined by the type of service for the on-system bridge and through discussions with the region.

Economic Factors/Impacts: This section examines the cost-benefit of completing a particular bridge by comparing rehabilitation versus replacement, the economy of scale by combining the structure with a companion bridge or roadway improvement, and/or rehabilitation or replacing a structure that has significant long-term maintenance or interim repair costs. This section will need the most discussion with the region to determine what funds the region can contribute to work outside of Bridge Enterprise and what their needs are.

Other Factors or Issues: Factors other than the current criteria and sub-criteria may have a significant impact on the decision to program a project. The sub-criteria can be both positive and negative and result in up to a 5 point modification in the total point score for the subject bridge. Examples of other factors include:

Positive Factors	Negative Factors
• Regional or local funding contributions to project • Accelerated Bridge Construction candidate • Innovative Contracting Method candidate	• Issues with an Intergovernmental Agreement • Limited funding resources for entire project • Right-of-Way constraints • Extensive environmental or railroad issues

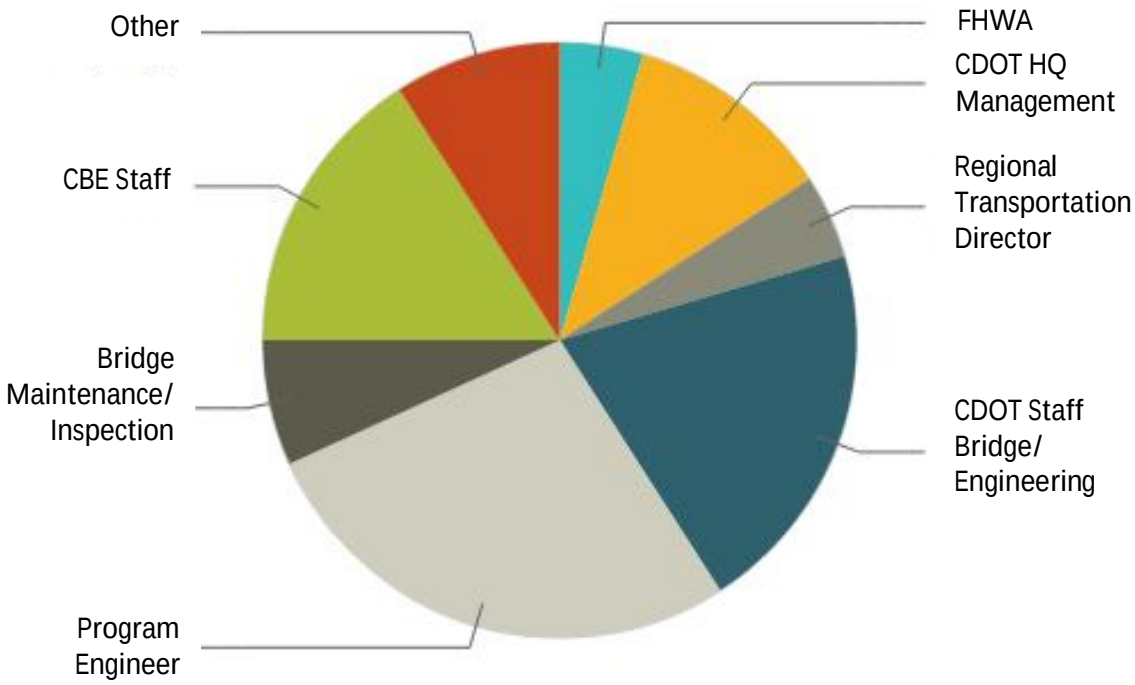
Reference Documents: Documents referenced in this summary include: the Prioritization Plan Scoring Worksheet, the Prioritization Plan Workflow Document, the Economic Strategic Corridor Map, and the Structure Inspection and Inventory Report. These documents will be used in the implementation of the Prioritization Plan.

Prioritization Plan Survey Results

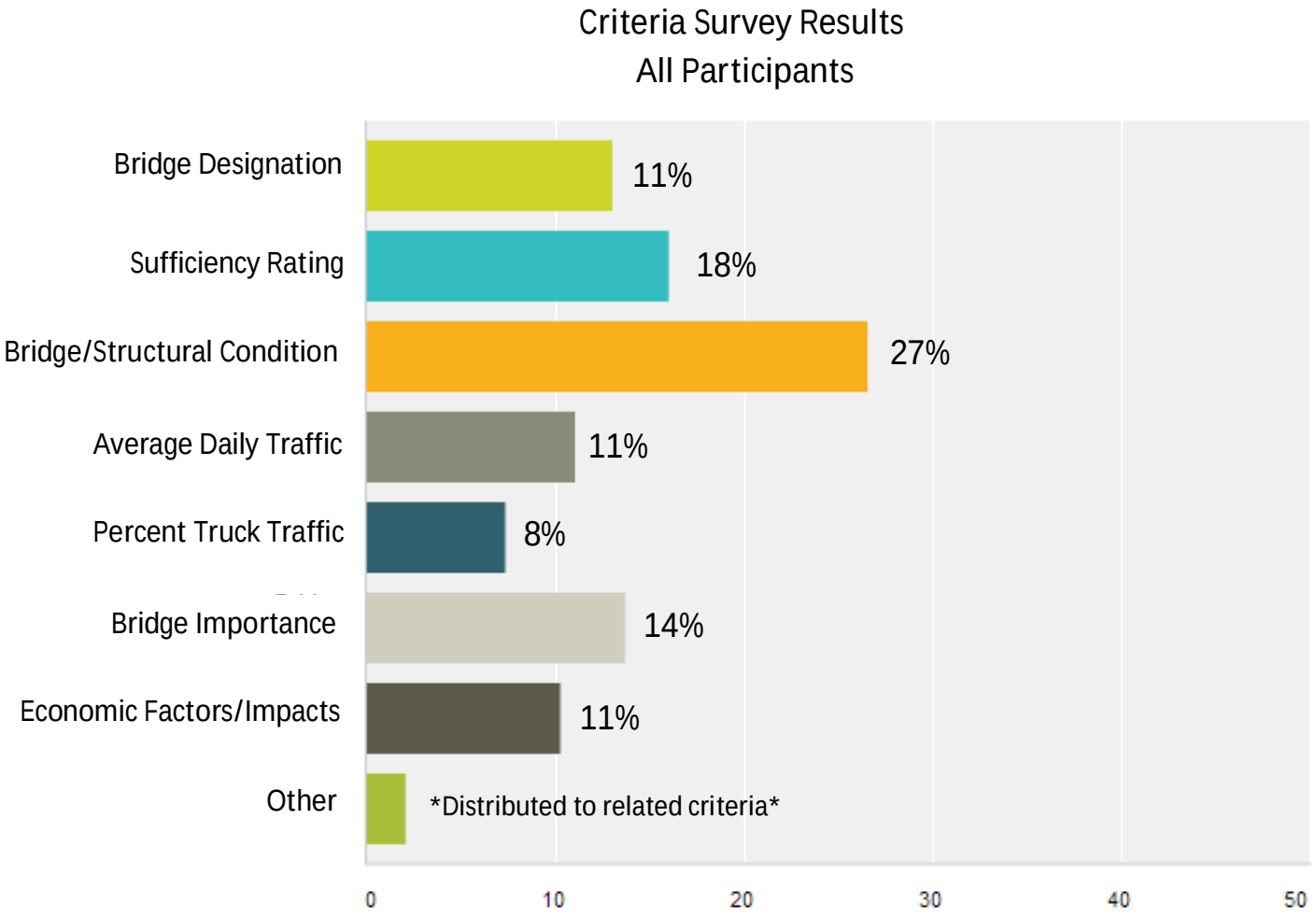
Participants – Sent to 70 people including 11 Board of Directors.

Received – 52 responded; 44 completed surveys

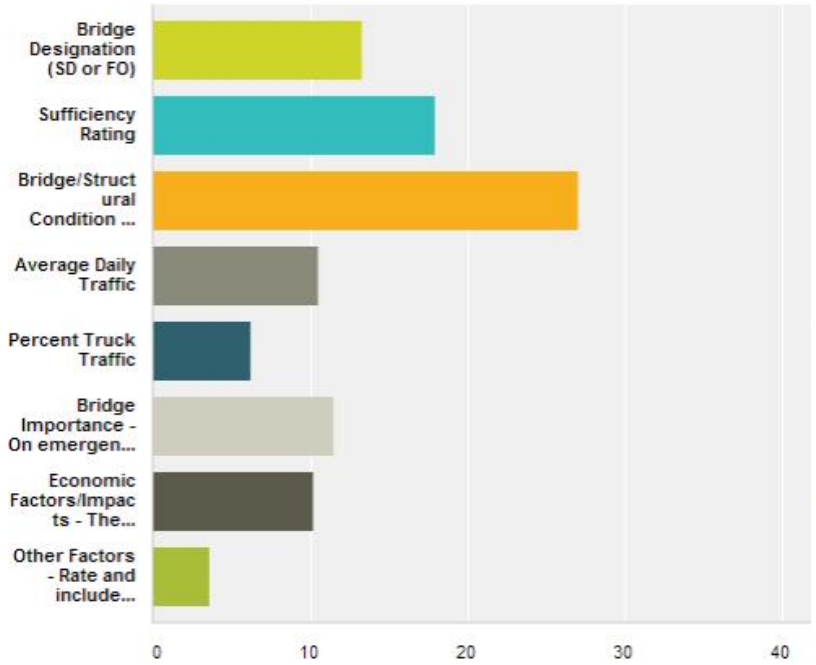
Participants by Affiliation/Involvement



Affiliation/Involvement	Completed Survey Responses	
FHWA	4.56%	2
CDOT HQ Management	11.36%	5
Regional Transportation Director	4.55%	2
CDOT Staff Bridge/Engineering	20.45%	9
Program Engineer	27.27%	12
Bridge Maintenance/Inspection	6.82%	3
CBE Staff	15.91%	7
Other	9.09%	4
Total		44


Criteria Survey Results
All Participants
Bridge Designation
11%
Sufficiency Rating
18%
Bridge/Structural Condition
27%
Average Daily Traffic
11%
Percent Truck Traffic
8%
Bridge Importance
14%
Economic Factors/Impacts
11%
Other
Distributed to related criteria
0
10
20
30
40
50

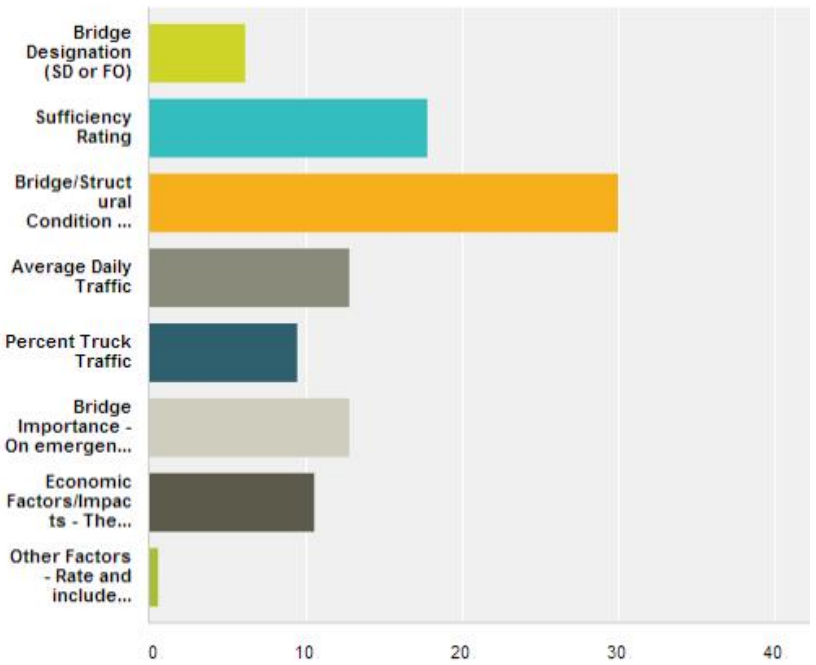
Criteria Survey Results
Technical



24 Participants

CDOT Staff Bridge/Engineering, Program Engineer, Bridge Inspection/Maintenance

Criteria Survey Results
Management



9 Participants

FHWA, CDOT HQ Management, Regional Transportation Director

Project:			
By:	Initals	Checked:	Initials
Date:	0/0/00		0/0/00
Sheet No.	1 of		2

Bridge Prioritization Plan — Scoring Worksheet

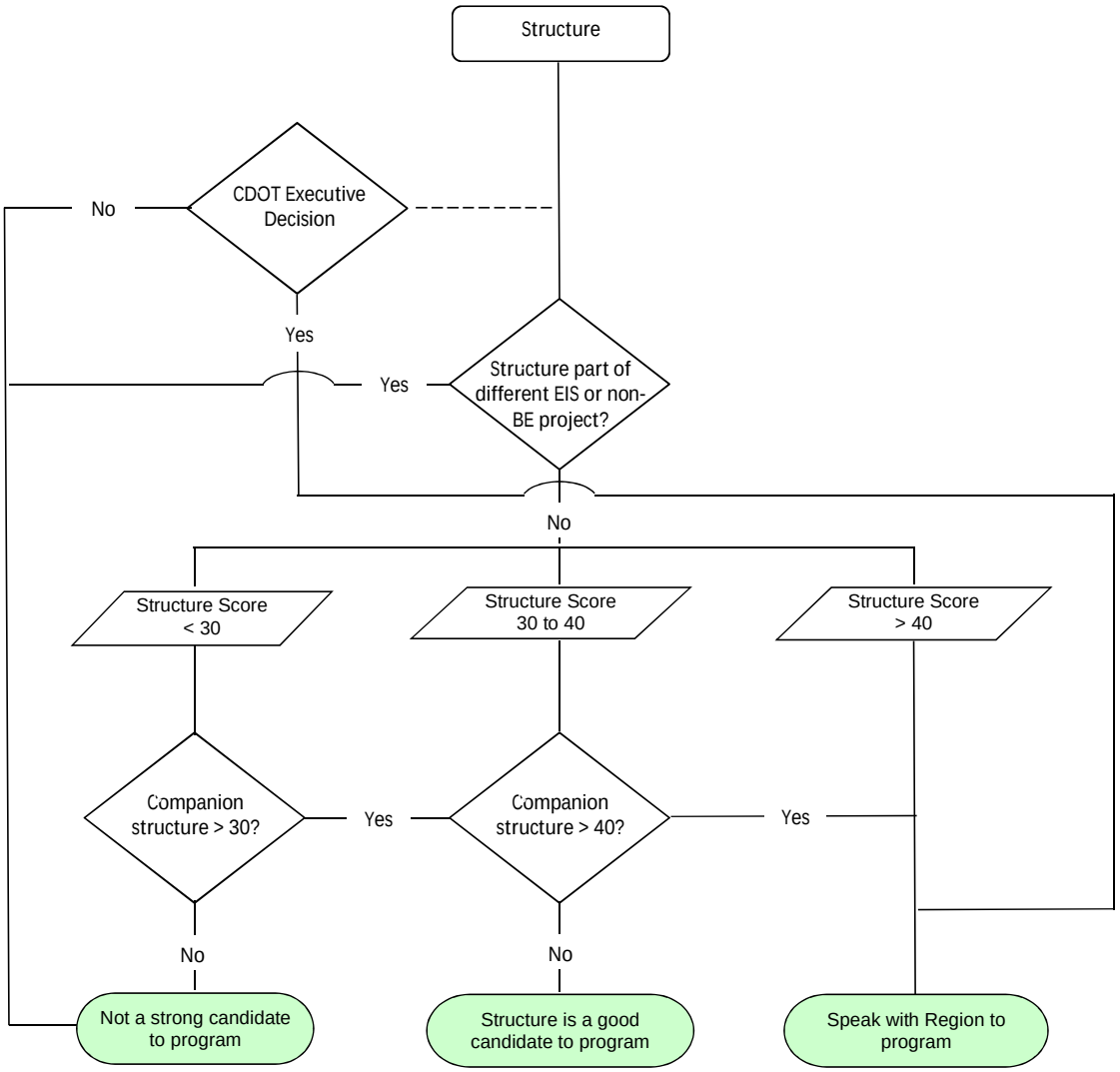
Major Criteria	Point totals	Sub-Criteria
Bridge Designation (pick one)	8	(●) Structurally Deficient ( ) Functionally Obsolete
Sufficiency Rating (pick one)	3	( ) < than 30.0 ( ) 30.1 to 40.0 (●) 40.1 to 49.9
Bridge Condition or Structural Condition (select if relevant)	0	☐ Load Restricted ☐ Scour Critical rating ≤ 4 ☐ Sub-structure rating ≤ 4 ☐ Superstructure rating ≤ 4 ☐ Deck structure rating ≤ 4 ☐ Insufficient vertical clearance
Average Daily Traffic (pick one)	1	(●) 0 - 400 ( ) 401 - 5,000 ( ) 5,001 - 15,000 ( ) 15,001 - 25,000 ( ) 25,001 +
% of Truck Traffic (pick one)	4	( ) Low (TT < 5%) ( ) Medium (6% to 10%) (●) High (TT > 10%)
Bridge Importance (select if relevant)	0	☐ Emergency/Evacuation Route ☐ Located along National Interstate Highway System ☐ Primary Access to Local Community ☐ Located along economic strategic corridor; freight, tourism, AG, oil/gas, etc. ☐ Historic Structure ☐ Significant pedestrian/bike crossing (CSS)
Economic Factors / Impacts (select if relevant)	0	☐ Rehabilitation ☐ Replacement ☐ Combine structure repair/replacement with companion bridge ☐ Combine structure with adjacent roadway improvement project ☐ Continued significant long-term maintenance and/or interim repair costs
Other Factors or Issues (select if relevant)		Identify other item(s) not listed above that positively/negatively impact rehabilitation or replacement of the structure. Use judgement to assign ± 5 points. Describe items in this text box.
Structure Score	16	

Bridge Prioritization Plan
Scoring Breakdown

MAJOR Criteria	Sub-Criteria and Scoring Weight			Extended Score	
		Criteria %	Sub %		
Bridge Designation					
(pick one)	Structurally Deficient	11	0.69	7.59	8
	Functionally Obsolete		0.31	3.41	3
Sufficiency Rating					
(pick one)	< than 30.0	18	0.548	9.864	10
	30.1 to 40.0		0.28	5.04	5
	40.1 to 49.9		0.172	3.096	3
Bridge Condition or Structural Condition					
(select if relevant)	Load Restricted	27	0.245	6.615	7
	Scour Critical rating equal to less than 4		0.172	4.644	4.5
	Sub-structure rating equal to less than 4		0.182	4.914	5
	Super-structure rating equal to less than 4		0.16	4.32	4.5
	Deck structure rating equal to less than 4		0.127	3.429	3
	Insufficient verical clearance		0.113	3.051	3
Average Daily Traffic		11			
(pick one)	0 - 400		0.096	1.056	1
	401 - 5,000		0.105	1.155	1
	5,001 to 15,000		0.172	1.892	2
	15,001 to 25,000		0.235	2.585	2.5
	25,001 and greater		0.392	4.312	4.5
% of Truck Traffic		8			
(pick one)	Low (TT < 5%)		0.173	1.384	1
	Medium (6% to 10%)		0.308	2.464	2.5
	High (TT > 10%)		0.519	4.152	4
Bridge Importance		14			
(select if relevant)	emergency / evacuation route		0.253	3.542	3.5
	located along National Interstate Highway System		0.201	2.814	3
	Primary access to local community		0.206	2.884	3
	Located along economic strategic corridor; freight, tourism, AG, oil/gas, e		0.204	2.856	3
	Historic Structure		0.053	0.742	0.5
	Significant pedestrain / bike crossing (CSS)		0.083	1.162	1
Economic Factors / Impacts		11			
(select if relevant)	Rehabilitation		0.226	2.486	2.5
	Replacement		0.206	2.266	2
	Combine structure repair/replacement with companion bridge		0.191	2.101	2
	Combine structure with adjacent roadway improvement project		0.176	1.936	2
	Continued significant long-term maintenance and/or interim repair costs		0.202	2.222	2
Other Factors or Issues					
(select if relevant)			5	x	5

Maximum Score 81

DEPARTMENT OF TRANSPORTATION	Project:	0		
	By:	Initals	Checked:	Initials
	Date:	0/0/00		0/0/00
	Sheet No.	2 of		2
Bridge Prioritization Plan	Workflow			



Prioritization Plan Sample Test Results

Bridge Description	I-25 NB over Indiana		I-25 SB over Indiana		US 50 over BNSF		US 50 over Draw	
Bridge ID	L-18-M		L-18-W		L-28-C		L-27-S	
County	Pueblo				Prowers			
Bridge Designation	SD	8	FO	3	SD	8	SD	8
Sufficiency Rating	26.6	10	46.8	3	45	3	45.2	3
Bridge/ Structural Condition	• Poor Substructure • Poor Deck	8		0	• Poor Superstructure • Poor Deck	7.5	• Poor Substructure	5
Average Daily Traffic	19,300	2.5	19,300	2.5	2,200	1	2,400	1
Percent Truck Traffic	8%	2.5	8%	2.5	21%	4	18%	4
Bridge Importance	• NHS • Strategic Cooridor • Historic Structure	6.5	• NHS • Strategic Cooridor • Historic Structure	6.5	• NHS • Primary Access • Strategic Cooridor • Historic Structure	9.5	• NHS • Primary Access • Strategic Cooridor	9
Economic Factors	• Rehabilitation • Companion Structure	4.5	• Rehabilitation • Companion Structure	4.5	• Replacement • Companion Structure • Roadway Improvement	6	• Replacement • Companion Structure • Roadway Improvement	6
Other								
Total	42			22	39			36
Workflow Result	Speak with Region to program				Structure is a good candidate to program			

Prioritization Plan Sample Test Results

Bridge Description	I-25 Service Rd over Pine Creek		I-70 over US 6, Railroad, City St			
Bridge ID	I-17-O		E-17-FX		E-17-FX (2010 report)	
County	El Paso		Denver			
Bridge Designation	FO	3	FO	3	SD	8
Sufficiency Rating	45.8	3	62	0	44	3
Bridge/Structural Condition		0		0	• Poor Superstructure • Poor Substructure • Poor Deck	12.5
Average Daily Traffic	8,310	2	137,000	4.5	137,000	4.5
Percent Truck Traffic	9%	2.5	10%	4	10%	4
Bridge Importance		0	• NHS • Primary Access • Strategic Cooridor • Emergency Route	12.5	• NHS • Primary Access • Strategic Cooridor • Emergency Route	12.5
Economic Factors	• Replacement	2	• Replacement • Companion Structure • Roadway Improvement • Long-term Maintenance	8	• Replacement • Companion Structure • Roadway Improvement • Long-term Maintenance	8
Other						
Total		12.5		32		52.5
Workflow Result	Not a strong candidate to program		Structure is a good candidate to program		Speak with Region to program	