PLT Meeting No. 7

CDOT Interregional Connectivity Study
Level 3 Evaluation Initiation

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August 13, 2013

Our objectives:

- Review past commitments – how are we doing?
- Gain endorsement on the direction of Level 3, Detailed Evaluation
- Present the remaining scenarios
- Discuss VE recommendations for the full build scenarios
- Define MOS options
- Present Full-System (ICS + AGS) BCA results

Where Are We In The Process?

Level 1 Critical Success Factors, Risks and Mitigations:

Have we fulfilled our obligations?

Level 1 CSFs, Risks and Mitigations – Any Lessons Learned?

Goal	Critical Success Factors	Risks	Mitigations
Develop a persuasive vision for HSIPR in Colorado	• Builds off of the State Rail Plan and other relevant transportation planning studies conducted in recent years. • ICS and AGS teams work together to develop mutually supporting strategies. • The vision is widely supported in all parts of the state. • A logical path toward implementation is defined. • Public support for local match funding is obtained. • Federal funding is obtained.	• Political support is not developed. • Project benefits are not perceived to be great enough to gain support for local funding. • Communities cannot come to agreement on the path forward for implementation.	• Incorporate to a maximum extent the results from previous publically endorsed transportation studies – State Rail Plan, I-25 North EIS, I-70 Mountain Corridor PEIS, Regional Transportation Plans etc. • Provide combined PLTs for the ICS and AGS projects. • Endorsement of the agency and public stakeholders at each project milestone. • Implementation of each of the mitigations defined below.

Goals, CSFs, Risks and Mitigations

Goal	Critical Success Factors	Risks	Mitigations
Develop a plan that maximizes ridership for HSIPR and RTDs FasTracks system	• Maximize connectivity between the projects.	• Development of competing systems • Too much focus on local wants without consideration of the system as a whole	• Use of the travel demand model to configure the best system. • Use of the CSS process to communicate the need for combined benefits for both systems. • Partnering with RTD
Maintenance of public support at all levels	• Open and honest communication system • Reliable defensible data • Transparency of the travel demand modeling • Inclusion of a broad spectrum of stakeholders in all key project decisions.	• Poor public communication • Stakeholders feel excluded from decision-making. • Goals of the mountain communities are different than those of the front range communities, and vice versa	• Inclusion of the mountain and Front Range communities in the decision making process though use of combined PLT and public workshops. • **Provide project press releases in Spanish and distribute to bi-lingual papers**

Goals, CSFs, Risks and Mitigations

Goal	Critical Success Factors	Risks	Mitigations
Develop a logical "next step" for implementing HSIPR in Colorado	• Defensible results, including ridership estimates, capital cost estimates, operating cost estimates and financial strategies • Communicate how the initial minimal operable segment fits into the larger picture for a state wide system • Generate public support for a phased approach resulting in the most logical (not political) first step.	• Insufficient engineering data to develop defensible ridership, capital and operating cost estimates. • Communities cannot agree on who gets the first phase of the project. • No agreement is reached on a logical funding mechanism.	• Use of Monte Carlo probability modeling to produce best case, most likely and pessimistic estimates for ridership and costs if engineering data is insufficient. • **Provide additional engineering design on the most difficult, high cost segments.** • **Include all communities in the selection of the MOS.** • **Demonstrate the benefits of the MOS.**

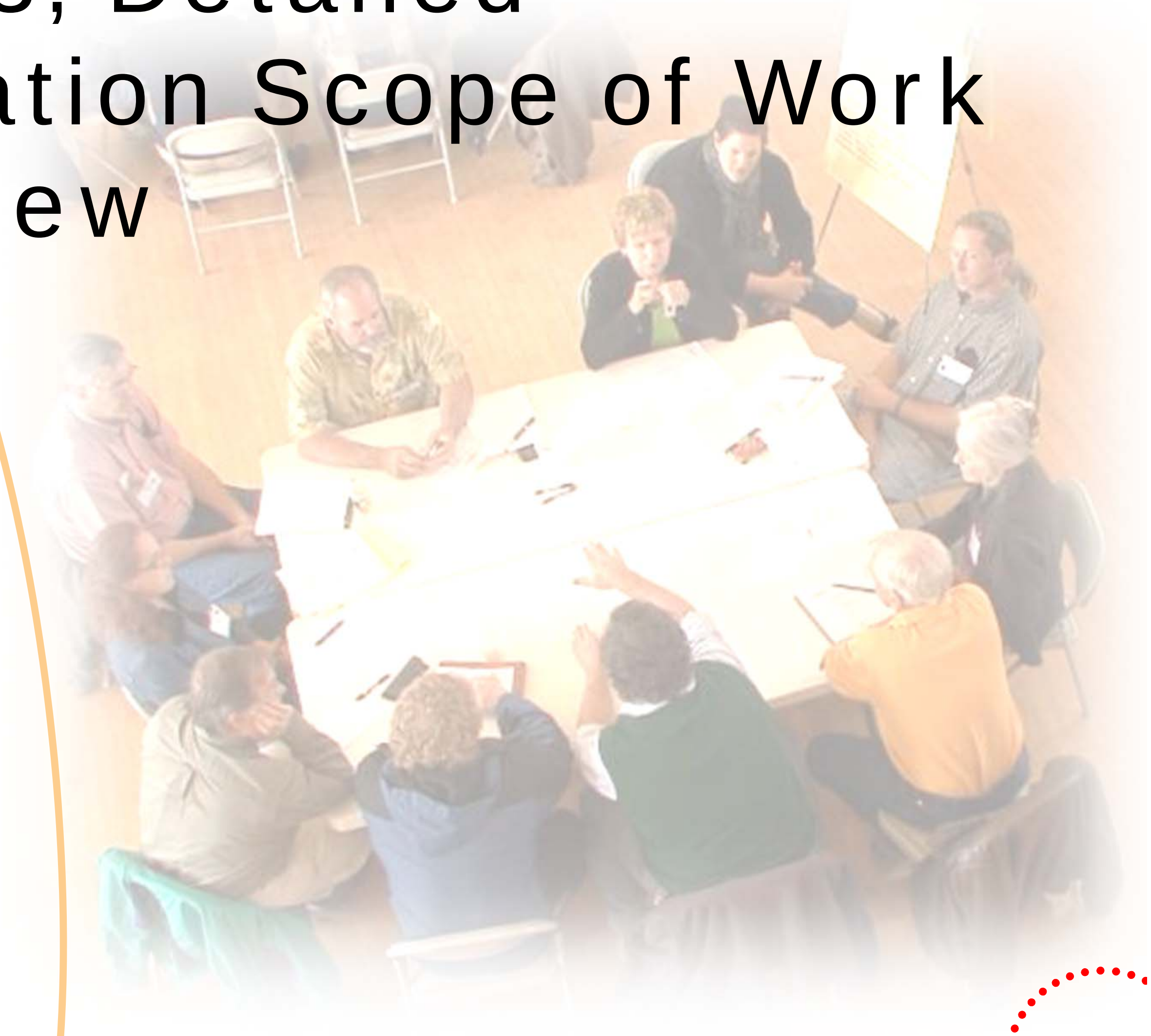
Goals, CSFs, Risks and Mitigations

Goal	Critical Success Factors	Risks	Mitigations
HSIPR is beneficial to Colorado	• Maximize ridership though configuration of an efficient highly utilitarian system. • Control the cost of the system • Obtain host community support for HSIPR • Demonstrate improvements in land use planning, air quality and sustainability. • Reduce the dependency on automobiles and imported fossil fuels. • HSIPR demonstrates economic development.	• Project becomes cost-ineffective due to implementation of high cost alignments and technology. • Political pressure results in too many stations affecting travel time and reducing ridership. • Station location becomes political and does not maximize economic development or ridership potential. • People do not use the system because it is not convenient.	• **All project recommendations need to be value engineered to be the most cost-effective possible.** • **The consequences of political solutions in favor of the best engineering solutions need to be effectively communicated.**

Goals, CSFs, Risks and Mitigations

Goal	Critical Success Factors	Risks	Mitigations
Develop an effective project funding and financial plan	• Project benefits are sufficient to develop support for local funding. • Local funding sources are strong enough to qualify CDOT for federal funding. • Federal funding agencies are convinced that the project sponsor (assumed to be CDOT) has the capacity and capability to implement a major HSR program.	• Lack of political support for generating local funding. • Project benefits are not sufficient. • Project does not demonstrate intercity passenger rail service operating above 79 mph. • Institutional agreements are not fulfilled. • Program technical capacity and capability (TCC) are not sufficient to generate federal confidence in the program.	• As stated above, the project concepts need to be **configured to maximize public benefits**. • **Public support for local funding is obtained due to demonstrated positive benefit/cost ratios for both capital and operating costs.** • Institutional agreements are obtained with affected railroads. • **CDOT demonstrates the TCC to implement the HSIPR program**.

Level 3, Detailed Evaluation Scope of Work Overview



Level 3, Detailed Evaluation Purpose

- *The purpose of this task order is to amplify work scope needed to complete Level 3 / Detailed Evaluation and Project Finalization, Project Leadership Team Meetings #7 and #8, and the final round of Public Meetings.*

- *The addition of this scope and associated budget will mean that the final phase of project work will extend from June 2013 to Fall 2013, estimated to be October 2013.*

ICS Interregional Connectivity Study

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Intent of Level 3, Detailed Evaluation

- *The final component of the Interregional Connectivity Study will review the various scenarios that remain after Level 2 evaluation & screening, evaluate their financial viability, assess their advantages and disadvantages, and formulate a set of recommendations.*
- *The recommendations should be legally and financially feasible, and include next steps. "Next Steps" could include choosing an alignment or minimal operable segment for more detailed evaluation.*
- *A Draft Report will be prepared, for stakeholder, CDOT, and FRA review, after which a Final Report will be submitted.*

Level 3, Detailed Evaluation Goals

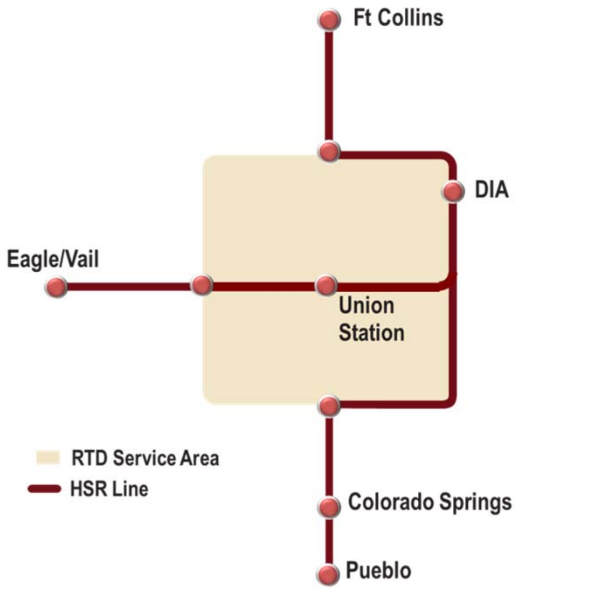
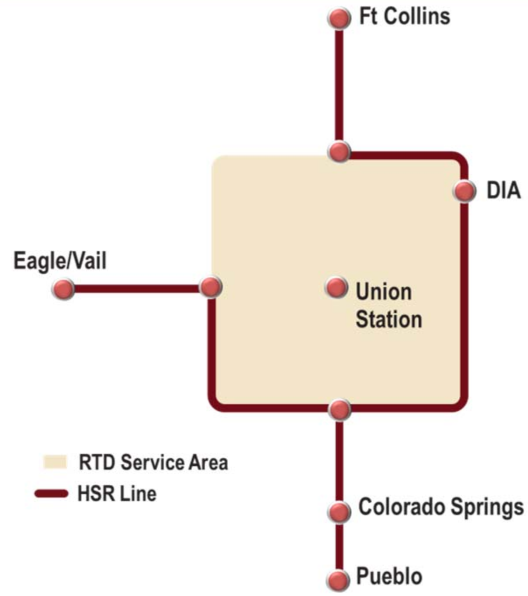
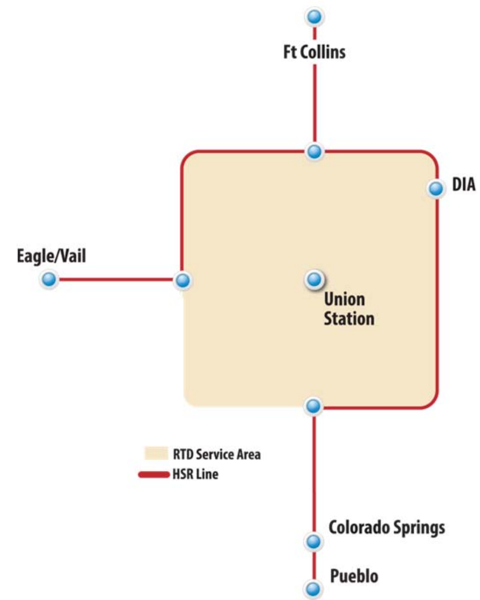
- Define the system performance, engineering, political and environmental advantages and disadvantages of the remaining alternative scenarios so that discriminators are readily apparent to the PLT and Stakeholder groups.
- Optimize the alignment for the N-S corridor outside of the Denver metro area (north of E-470 and south of C-470).
- In conjunction with the AGS Team, optimize the alignment for the I-70 Mountain Corridor outside of the Denver metro area (west of C-470).
- Identify the best alignment through the Denver metro area to DIA.
- Identify the projected ridership, revenues and operating surplus for the preferred scenario.
- Define a funding and financial strategy for the preferred scenario.
- Define a phasing strategy for the preferred scenario.
- Define a regulatory strategy of the preferred scenario.

Summary of the Scope of Work

- Step 1: Refine the Full Build Scenario
  - Engineering – improve the cost-effectiveness thru VE
  - Planning – improve the operating efficiency
  - Environment – Mitigate hot spots, where possible
  - Finance – Conceptual Financial Plan
- Step 2: Identify and Optimize MOS Options
  - Engineering – improve the cost-effectiveness thru VE
  - Planning – improve the operating efficiency
  - Environment – Mitigate hot spots, where possible
  - Finance – Financial Plan
- Public Involvement
  - 2 PLT meetings (August & October), 4 Public workshops (October)
  - MOS strategy
- Reports (November) and Closeout (December)

Alternatives Remaining: Full-Build Scenario Strategy

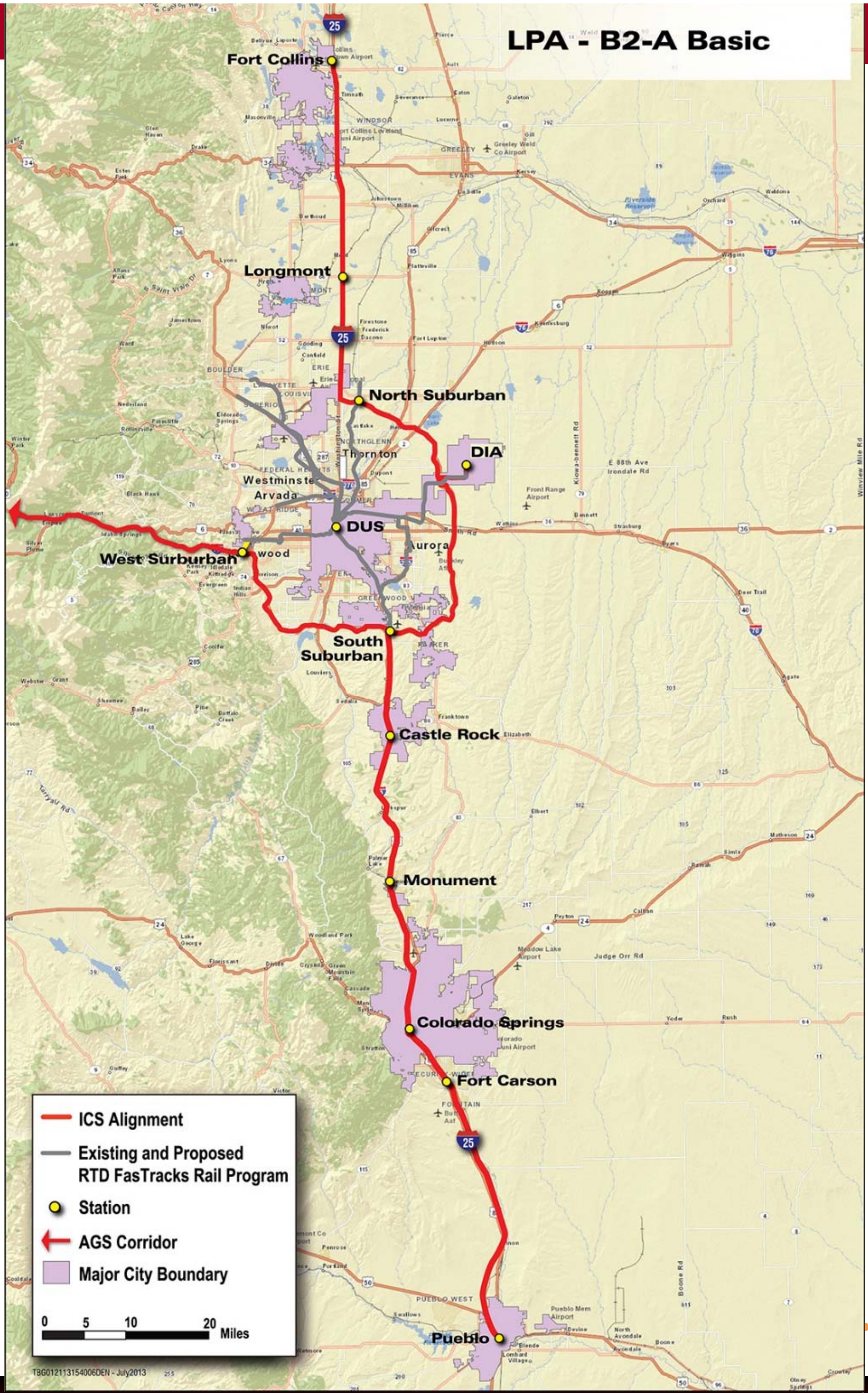
3 Scenarios Remain from Level 2 - In reality it is 1!

	A-5A	B-2A	B-3
			
CAPEX	$14.2 Billion	$13.4 Billion	~$13.9 Billion
OPEX	$186 Million/yr	$206 Million/yr	~$206 Million/yr
Ridership	12.9 million/yr	13.8 million/yr	13.7 million/yr
Revenue	$248 Million/yr	$250 Million/yr	~$248 Million/yr
OPEX Ratio	1.33	1.21	~ 1.20

How do 3 Scenarios = 1 Scenario?

- All share the same North to South alignment, ~ 190 miles
- All share the same Mountain Corridor alignment ~ 140 miles
- All share the same stations
- The only decision remaining is how to get E-W through Denver:
  - Use the NW Quadrant (Original B-5 Scenario)
  - Use I-76 (Original A-5A Scenario)
  - Use C-470 (Original B-2A Scenario)
- This decision is in the future under likely changed conditions

LPA – B2-A - Basic



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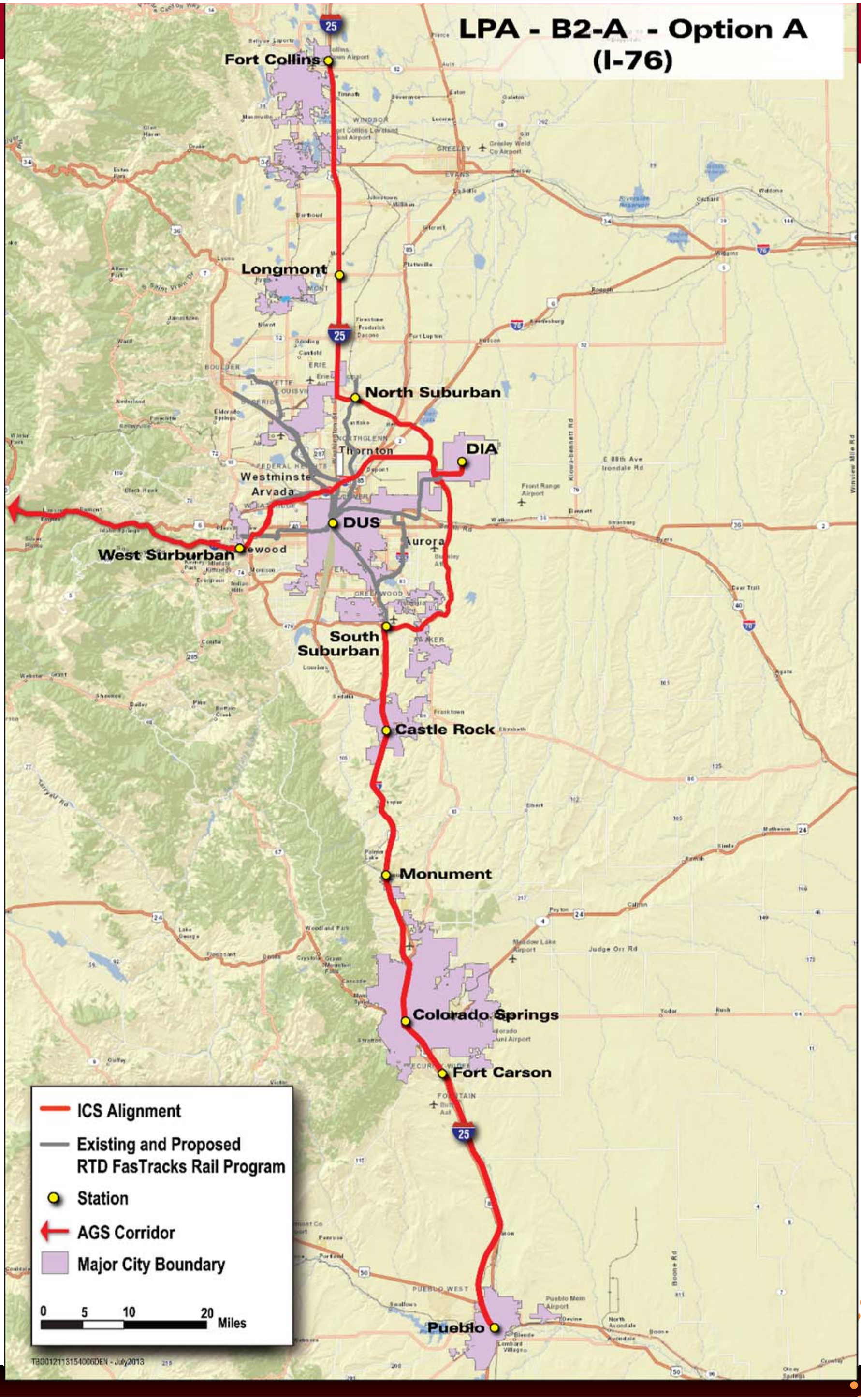
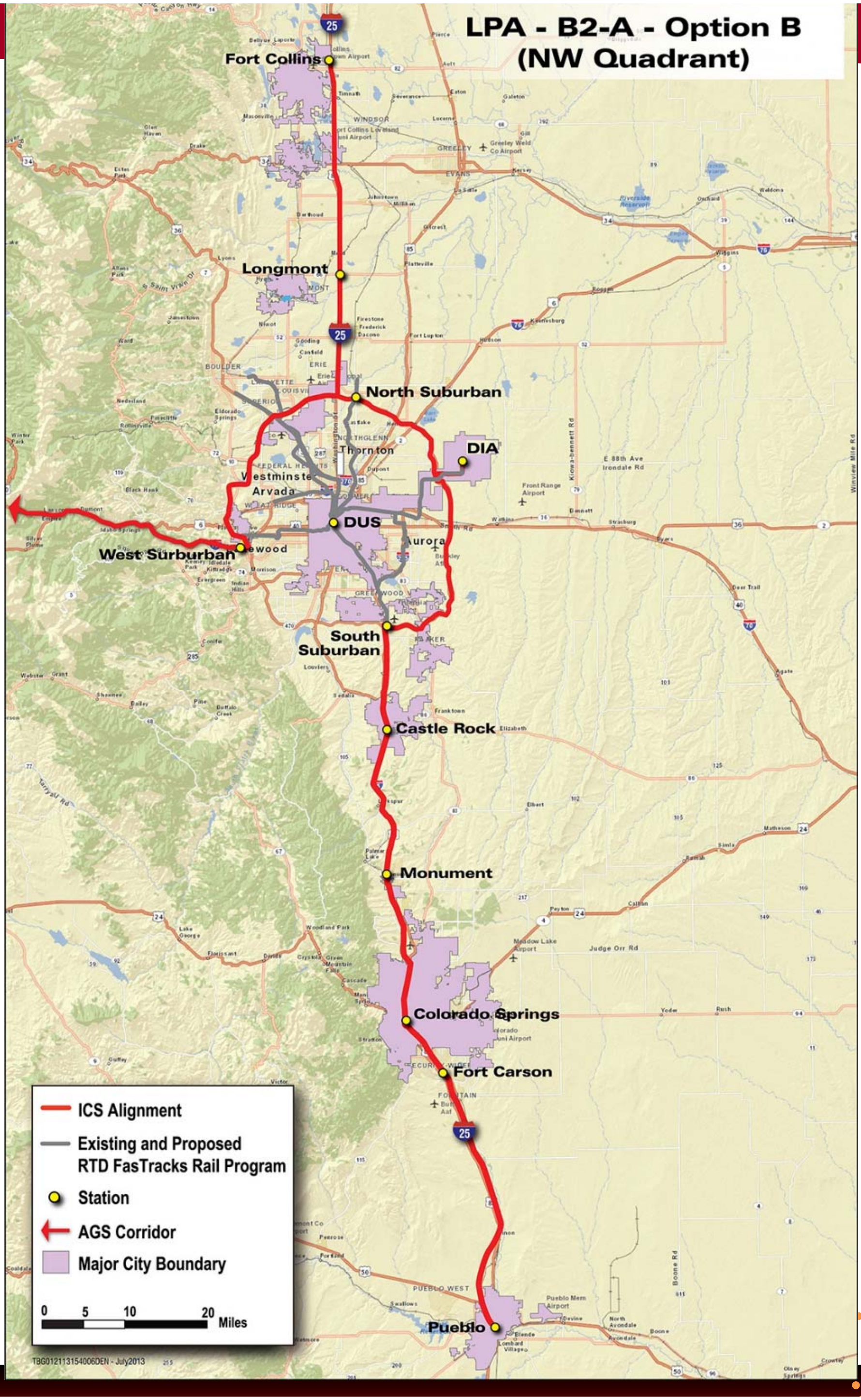
LPA – B-2A – Option A (I-76)



LPA – B-2A – Option B (Northwest Quadrant)



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What will we do to "VE" the scenarios

- What is VE versus Cost Cutting?
  - VE means reducing costs without affecting operability
  - Cost cutting affects operability and often flexibility
  - We will do both.
- Ideas we are looking at:
  - Single track alignments assuming the same service plan & travel speeds
  - Single track at stations with reduced travel speeds
  - Use of diesel technology to eliminate electrification (likely to be rejected)
  - Possible elimination of some grade crossings
  - Reduction of the amount of ROW requirements
  - Local participation for station funding

Minimum Operable Segment Strategy

Process for Defining the MOS

- What are the top options?
  - DIA to Fort Collins
  - West Suburban to Breckenridge
  - DIA to COS
  - South Suburban to COS
  - Castle Rock to South Suburban
  - Castle Rock to DIA
  - COS to Pueblo
  - Eagle to Vail
- What's the timing – Start construction in 2020?
- What's the budget - $3 Billion?
- Reconcile with the PLT – What do you think?

Basic Strategy for a Implementable MOS

- How can we reduce the cost of the MOS?
  - Single track
  - Dual mode diesel/electric
  - Lower speeds
  - Simplified service plans
  - Minimal grade separations, etc.
  - Modest stations
  - Shared MF with RTD
- How do we maintain strong ridership
  - 110 mph speed (or more)
  - Added stations?

What about technologies?

- MOS's accommodate all technologies, with two choices:
  - Interoperate with RTD (not agnostic)
  - Forced transfer to RTD (is agnostic)
- Forced Transfer will reduce ridership by 5 to 10 percent
- Conventional technology has the advantage of single track configuration
- The decision is likely 5 years in the future, allowing maturation of alternate technologies

Options for FRA Compliance

- Fully compliant rolling stock using original 800,000 buff strength
- Fully compliant rolling stock using recent Crash Energy Management (CEM) techniques to achieve equivalent capability
- Temporal separation using both compliant and non-compliant equipment
- Extend Light Rail System along corridor using light rail compatible equipment (this interurban regulatory exception has not been relied upon in decades)
- Use tram-train technique used in Europe to interoperate light rail type vehicles on FRA compliant lines – will require special construction to meet USA CEM requirements

Dual Mode Vehicles

- Current operation in Troyes, France uses dual mode diesel and electric in a single self-propelled rail vehicle manufactured by Siemens
- Dual mode locomotives manufactured by GE are used by Amtrak and Metro North with very high reliability
- Other types of dual mode vehicles include the capability to operate with both low voltage DC and high voltage AC systems
- Dual mode costs are coming down due to sophisticated electronic controls that can work with a wide variety of power sources

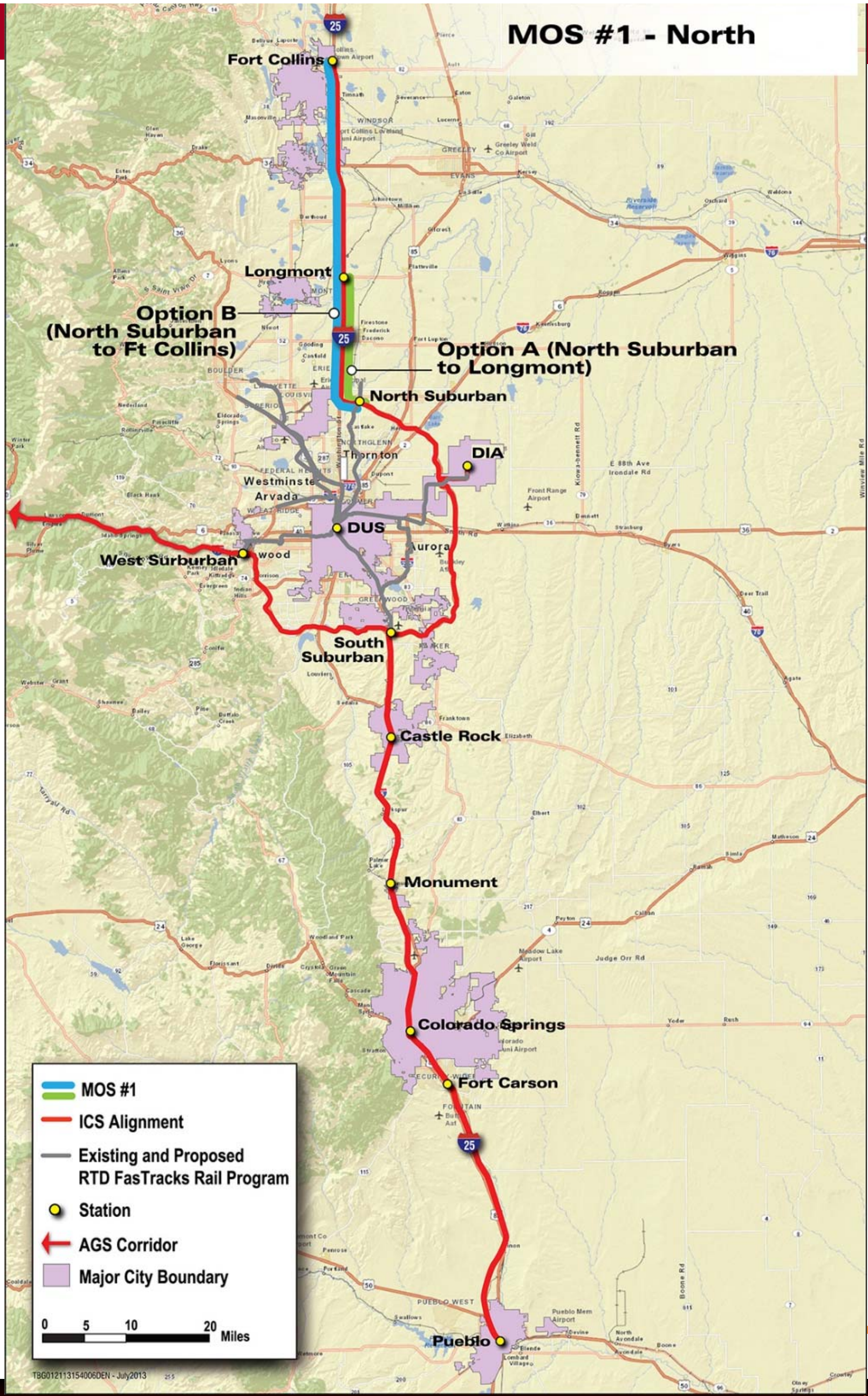
Interoperation between LRT and CRT

- Light Rail vehicles use a narrower body width and a shorter car body length to operate around tight curves and fit on roadway lanes.
- When operated on a Commuter Rail line, LRT vehicles need devices to meet platforms such as step extenders and height adjustment.
- CRT signal systems may not be sensitive enough to detect Light Rail vehicles – some mitigation is available.
- Light Rail pantographs may not be able to reach the higher wire height on an electrified CRT line.
- Major program issues include regulatory compliance, vehicle design and cost increment, and dispatching issues.

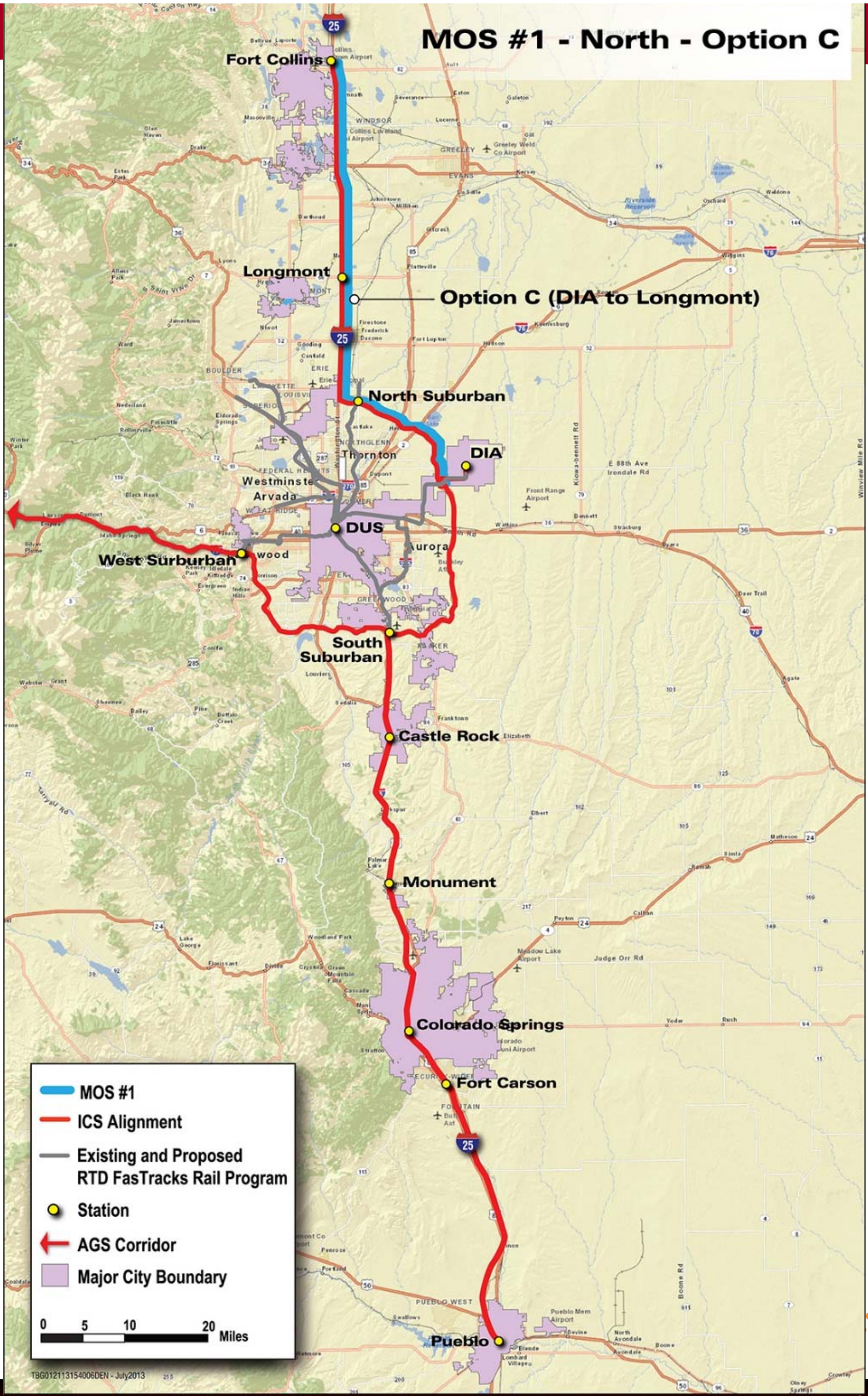
Communities that have Successfully Implemented Special FRA Compliance

- Trenton, NJ – LRT/DMU operation over freight line
- Austin, TX – LRT/DMU operation over freight line
- Oceanside, CA – LRT/DMU operation over freight line
- San Diego, CA – Electric LRT operation over freight line
- San Jose, CA – Approved Joint Operation of Electric HSR and Electric CRT with temporal freight operation

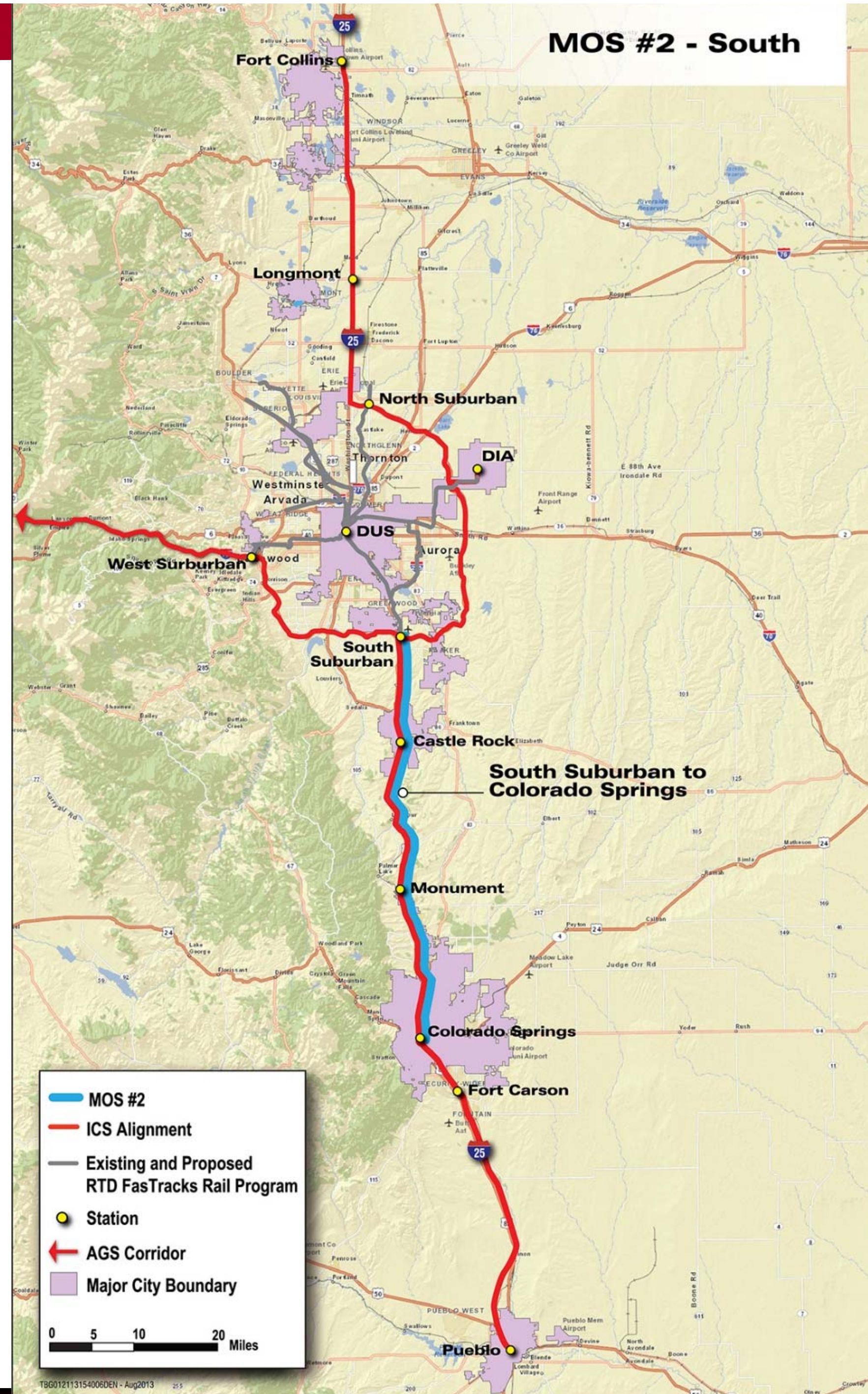
MOS #1 – North Options A&B



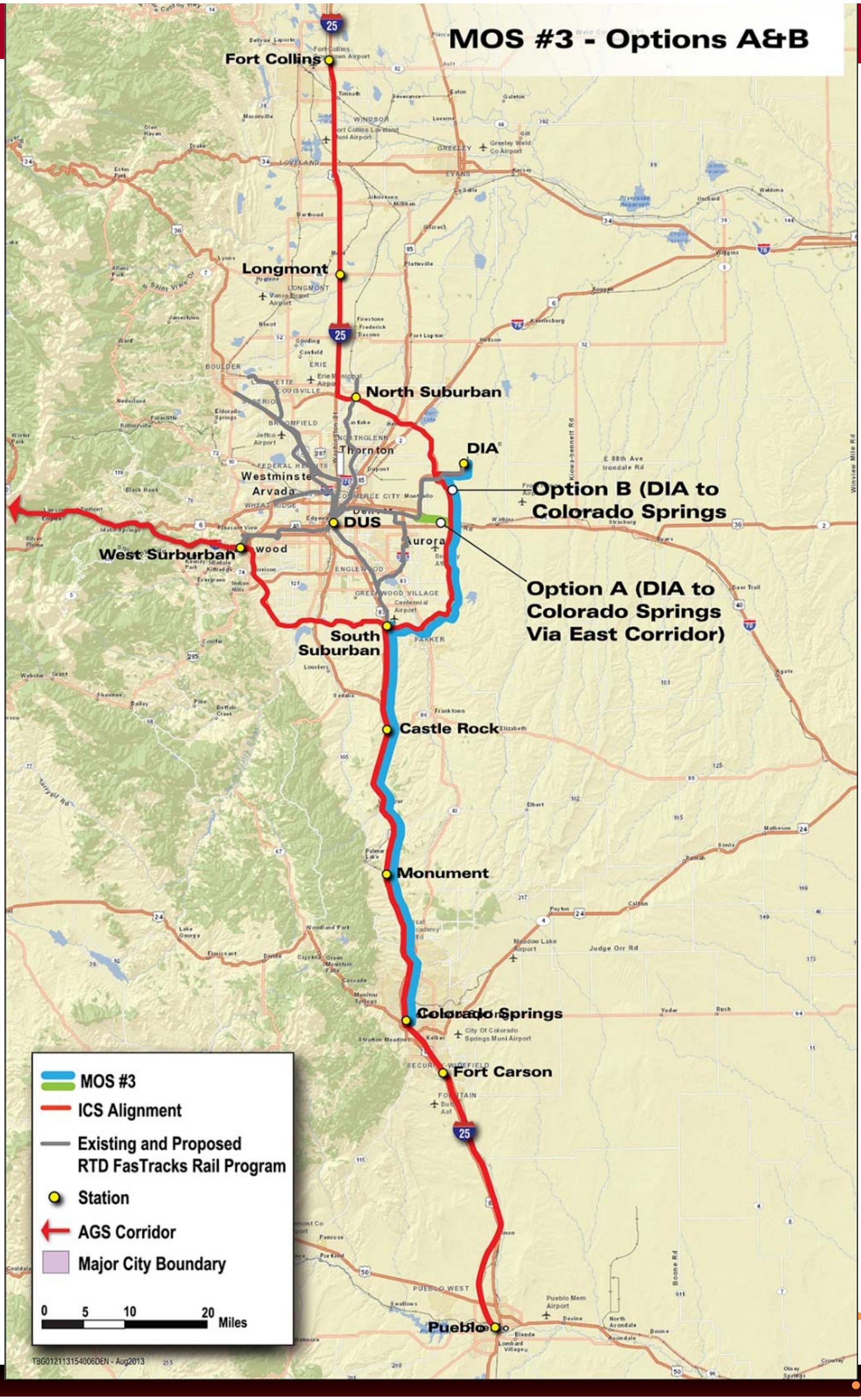
MOS #1 – North Option C



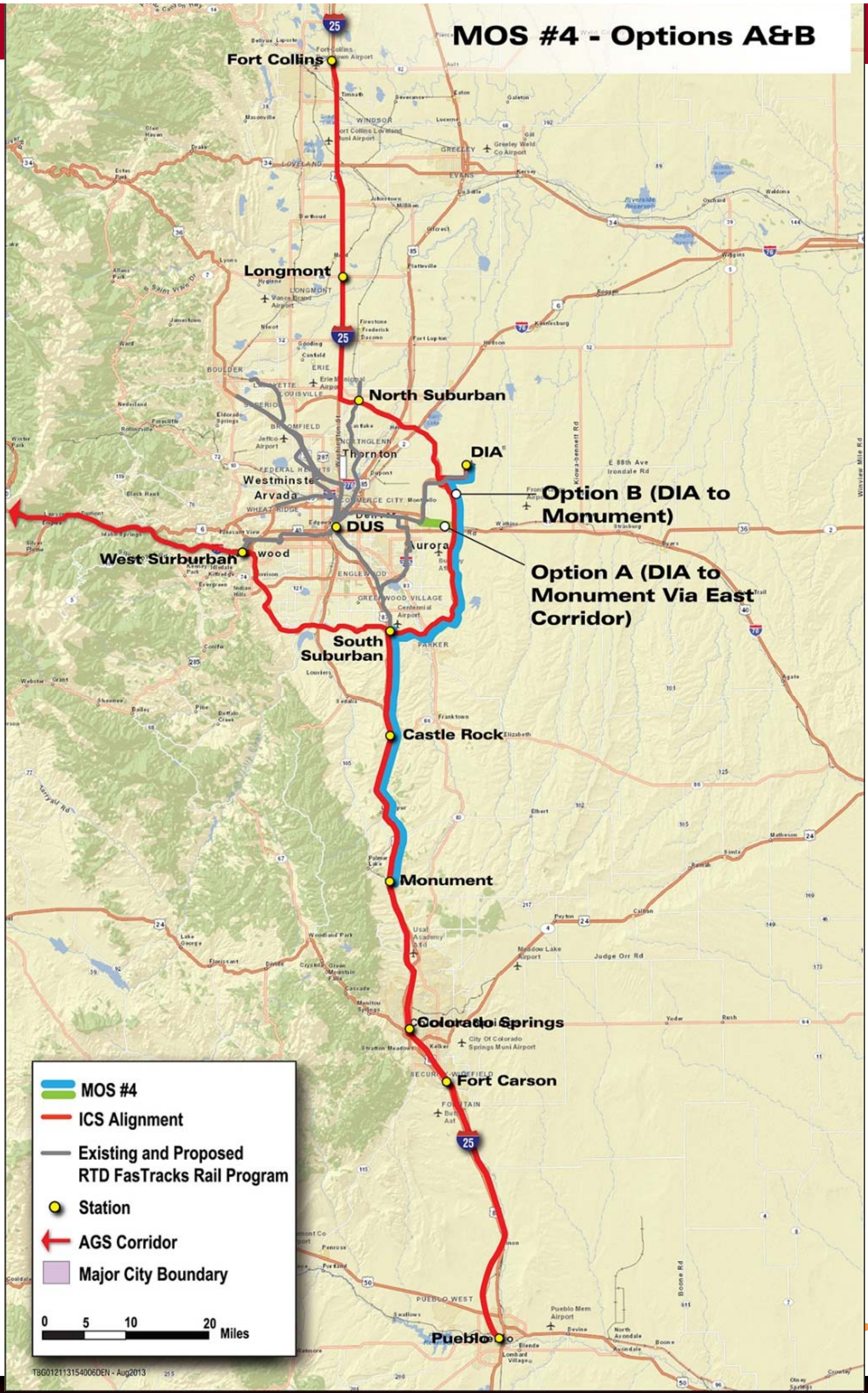
MOS #2 – South


MOS #2 - South
Fort Collins
Longmont
North Suburban
DIA
Thornton
Westminster
Arvada
DUS
Aurora
West Surburban
South
Suburban
Castle Rock
South Suburban to
Colorado Springs
Monument
Colorado Springs
Fort Carson
Pueblo
MOS #2
ICS Alignment
Existing and Proposed
RTD FasTracks Rail Program
Station
AGS Corridor
Major City Boundary
0 5 10 20 Miles

MOS #3 – South Options A&B



MOS #4 – South Options A&B



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ICS MOS Options (no VE)

MOS Alternative	Criteria			
	CAPEX (B$)	Ridership	$/Ride	$/Rider Mile
MOS #1: Shared Build with RTD North Metro				
• Option 1: North Suburban to Longmont, interoperate with RTD	$1.15	219,000	$304	$12.65
• Option 2 North Suburban to Fort Collins	$1.90	1,700,000	$65	$1.62
MOS #1A: DIA to FC with transfer to DUS	$3.00	3,000,000	$58	$0.95
MOS # 2: Build South Suburban to COS				
• Option 1 - Preferred: Interoperate with RTD to DUS	$3.80	2,900,000	$76	$1.55
• Option 2 – Forced Transfer at South Suburban	$3.80	2,640,000	$83	$1.70
MOS # 3: DIA to South Suburban to COS				
• Option 1 - Interoperate with RTD East Corridor to DUS	$5.40	3,862,000	$81	$1.16
• Option 2 – Transfer at DIA (allows maglev)	$5.80	4,032,000	$83	$1.09
MOS # 4: DIA to South Suburban (via E-470) to Monument				
• Option 1 - Interoperate with RTD East Corridor, but lower cost	$4.10	3,218,000	$74	$1.44
• Option 2 - Transfer at DIA	$4.50	3,077,000	$85	$1.48

AGS MOS Options

	CAPEX (B$)	Ridership	$/Ride	$/Rider Mile
AGS MOS # 1: West Suburban to Breckenridge				
• High Speed Rail	$19.01	515,000	$2,135	$35.13
• High Speed Maglev	$14.14	616,000	$1,327	$22.85
• 120 mph Maglev	$5.54	491,400	$652	$10.63

BCA Update – ICS + AGS

B/C Element	Scenario A-5a w/TRI	Scenario B-2a w/TRI	Scenario C-1 w/TRI	Scenario B-2a w/ 120 mph maglev
Costs				
CAPEX ICS	0	$ -	$ -	$ -
CAPEX AGS	13,337,000,000	$ 13,337,000,000	$ 13,337,000,000	$ 10,871,000,000
Annual OPEX	76,616,400	$ 75,789,000	$ 27,281,000	$ 75,789,000
OPEX Cost (30 year)	1,324,697,556	$ 1,310,391,810	$ 471,688,490	$ 1,310,391,810
Interest payments	4,792,584,265	$ 4,792,584,265	$ 4,792,584,265	$ 3,906,439,495
Total Cost	**$ 19,454,281,821**	**$ 19,439,976,075**	**$ 18,601,272,755**	**$ 16,087,831,305**
Benefits				
Basic Data				
Ridership	$ 2,479,067	$ 2,995,484	$ 2,032,963	$ 2,995,484
Ticket Revenue	$ 58,556,366	$ 68,995,112	$ 44,848,406	$ 68,995,112
Reduction in Vehicle-Miles[1]	$ 67,155,898	$ 80,862,540	$ 50,941,838	$ 80,862,540
Reduction in Vehicle-Hours[1]	$ 181,469	$ 270,293	$ 90,416	$ 270,293
VMT Benefit	$ 37,607,303	$ 45,283,022	$ 28,527,429	$ 45,283,022
VHT Benefit	$ 4,173,778	$ 6,216,740	$ 2,079,574	$ 6,216,740
Fatality Avoided	$ 4,580,032	$ 5,514,825	$ 3,474,233	$ 5,514,825
Calculated Benefits (PW basis)				
Increase in Real Estate Value - one time deal, no PW calc.	$ 1,302,000,000	$ 1,302,000,000	$ 1,302,000,000	$ 1,302,000,000
Fare Box Revenue (30 year)	$ 1,012,439,575	$ 1,192,925,484	$ 775,428,934	$ 1,192,925,484
PW of VMT	$ 650,230,269	$ 782,943,454	$ 493,239,256	$ 782,943,454
PW of VHT	$ 72,164,615	$ 107,487,430	$ 35,955,828	$ 107,487,430
PW of Fatality Avoided	$ 79,188,758	$ 95,351,328	$ 60,069,495	$ 95,351,328
Pollution benefits	$ 231,063,971	$ 278,224,549	$ 175,276,093	$ 278,224,549
PW of Operations Jobs	$ 662,348,778	$ 655,195,905	$ 235,844,245	$ 655,195,905
PW of Non-basic jobs (1.5 multiplier)	$ 331,174,389	$ 327,597,953	$ 117,922,123	$ 327,597,953
50% Federal funding	$ 6,668,500,000	$ 6,668,500,000	$ 6,668,500,000	$ 5,435,500,000
Multiplier effect of Federal funding (2.0 multiplier)	$ 13,337,000,000	$ 13,337,000,000	$ 13,337,000,000	$ 10,871,000,000
Construction Employment	$ 5,408,153,500	$ 5,408,153,500	$ 5,408,153,500	$ 4,408,190,500
Non-basic jobs (2.0 multiplier)	$ 3,569,381,310	$ 3,569,381,310	$ 3,569,381,310	$ 2,909,405,730
Total Benefits	$ 26,655,145,165	$ 27,056,260,913	$ 25,510,270,783	$ 22,930,322,333
Sum of Benefits (PW Cost Basis)	$ 26,655,145,165	**$ 27,056,260,913**	**$ 25,510,270,783**	**$ 22,930,322,333**
Sum of Costs (PW Cost Basis)	**$ 19,454,281,821**	**$ 19,439,976,075**	**$ 18,601,272,755**	**$ 16,087,831,305**
B/C Ratio	**1.37**	**1.39**	**1.37**	**1.43**
Operating Ratio	**0.76**	**1.21**	**1.64**	**0.91**

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What Drives the BCA?

- The greatest drivers of the positive results include:
  - Impact of Federal funding
  - Multiplier assumed for Federal funding
  - Construction employment
  - Spin-off employment from construction

- If we downplay the effects of Federal funding the results are very different:
  - BCA shows a ratio of about 1.5 with a multiplier of 2 (versus 3)
  - Eliminating the effects of Federal funding causes the ratio to go down to ~1.0

- The addition of the AGS erodes the Operating Ratio

Look Ahead Schedule

- Identify potential MOS options – July 26
- Initiate VE of the Full Build Scenarios and MOSs July 31
- Complete VE studies – August 21
- Revised cost estimates – August 21
- Revised ridership studies for the FB Scenario – August 28
- Revised plan-set for the FB Scenario – September 18
- Eng/Environmental complete on the final MOS options – October 8
- Possible PLT – September 17
- Final PLT – week of October 14
- Public Open Houses week of October 21
- Draft AA Report – November 7
- Project closeout –December 31

Thank you for Attending!