

Public Workshop No.2: Evaluation of Conceptual Alternatives CDOT Interregional Connectivity Study



CH2MHILL®

May 2013

The Goals Of This Meeting Are To:

- ▶ Provide an update on the ICS project Level 2 Evaluation
- ▶ Hear your input on the final 5 scenarios – Endorse a final 2 to 3 scenarios
- ▶ Hear your input on revenue and financing options
- ▶ Better understand potential environmental and community impacts and where they serve as discriminators

Where Are We In The Process?



Next Steps

- ✓ Refine alternatives to improve performance
- ✓ Assess impacts in challenging areas
- ✓ Fine tune the service plan to reduce Operating Expenses
- ✓ Update cost estimates
- ✓ Develop a Phasing Plan
- ✓ Develop a Financial Plan



*A Refresher from
Level 1*

ICS Study Sponsors & Purposes

🎯 Sponsors:

- CDOT with funding from the Federal Railroad Administration

🎯 Purposes:

- Provide cost-effective recommendations for alignments, technologies and station locations in the Denver Metro Area **that maximize ridership between high speed rail & RTD.**
- Suggest method for integrating HSIPR into **the statewide multi-modal network.**
- Develop the basis for **next steps.**



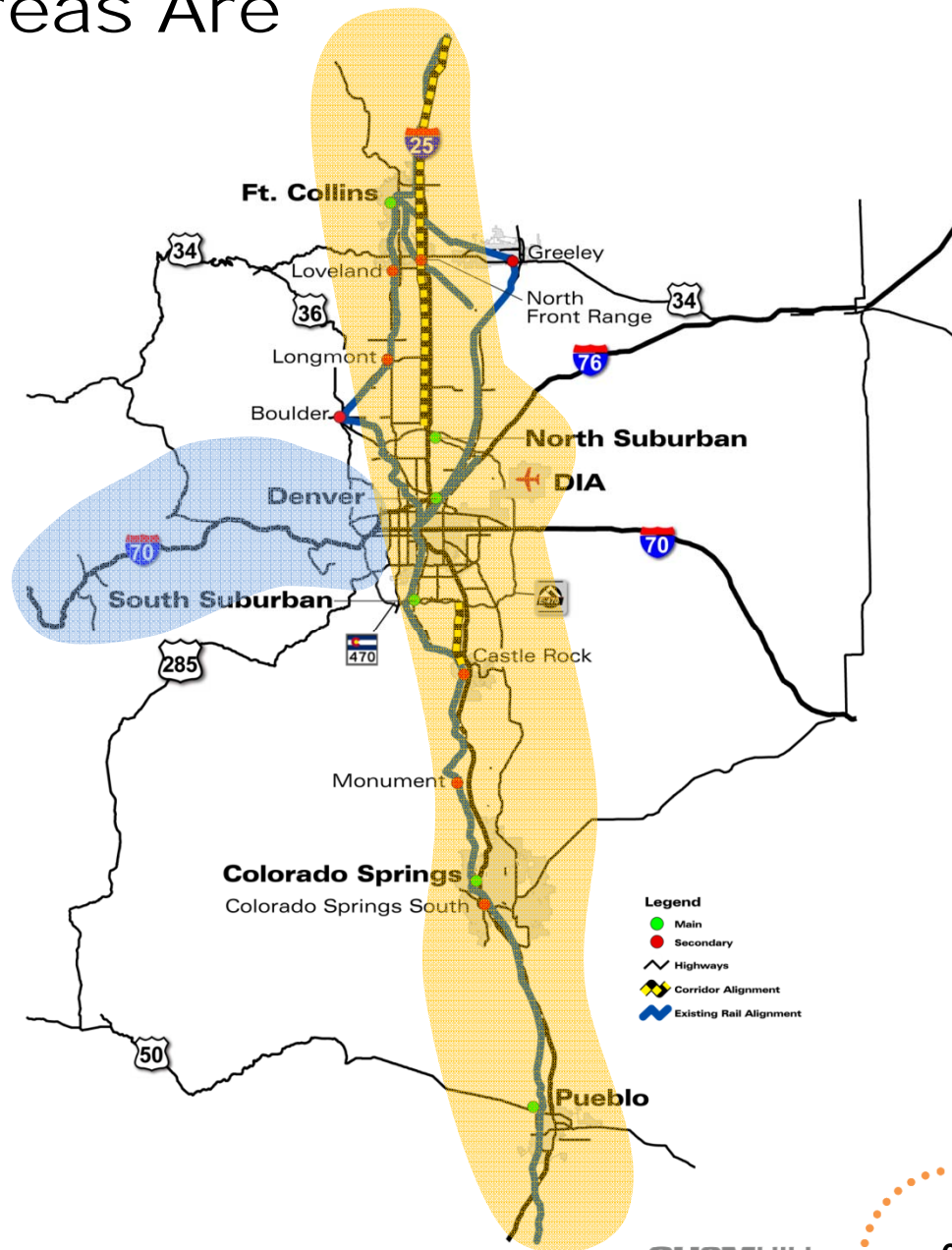
ICS and AGS Study Areas Are Tightly Linked

ICS – Front Range

- Fort Collins
- Denver
- Colorado Springs
- Pueblo

AGS – Mountains

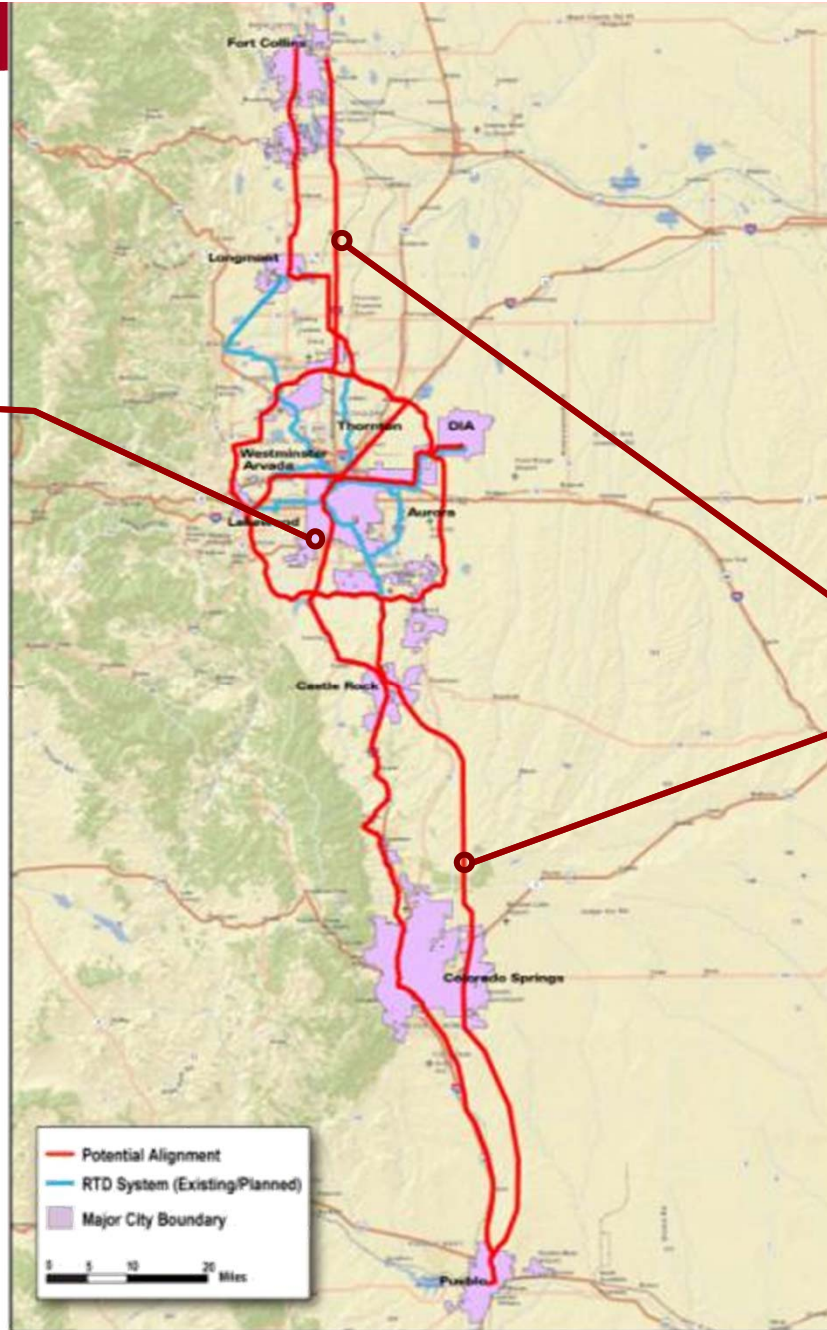
- Eagle County Airport



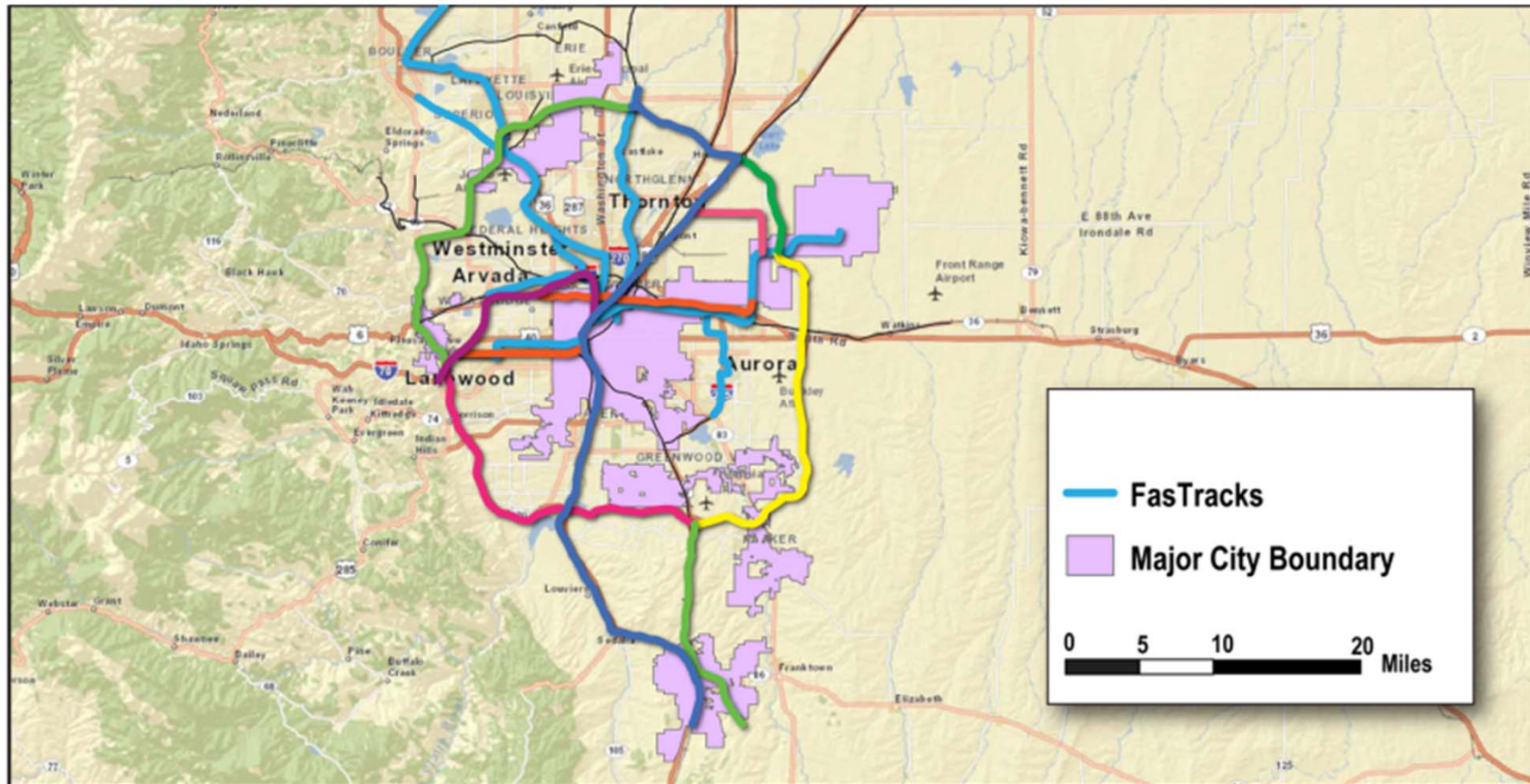
Logic

Study Segments through and around Denver

Determine the best Segments going North and South



Four Basic E-W Segments And One N-S Segment Remained Going Into Level 2



What Was Promised At The Conclusion Of Level 1 Evaluation?

- ▶ Assessment of an alternative to the Black Forest alignment
- ▶ **Add an alignment along the I-76 through Denver to DIA**
- ▶ Revise the C1 Shared Track with RTD scenario to allow travel to the south
- ▶ Prepare better information on costs, benefits and impacts of the final 5 scenarios
- ▶ Perform an initial Benefit/Cost Assessment



Level 2 Evaluation

-Goals, Criteria

-Results

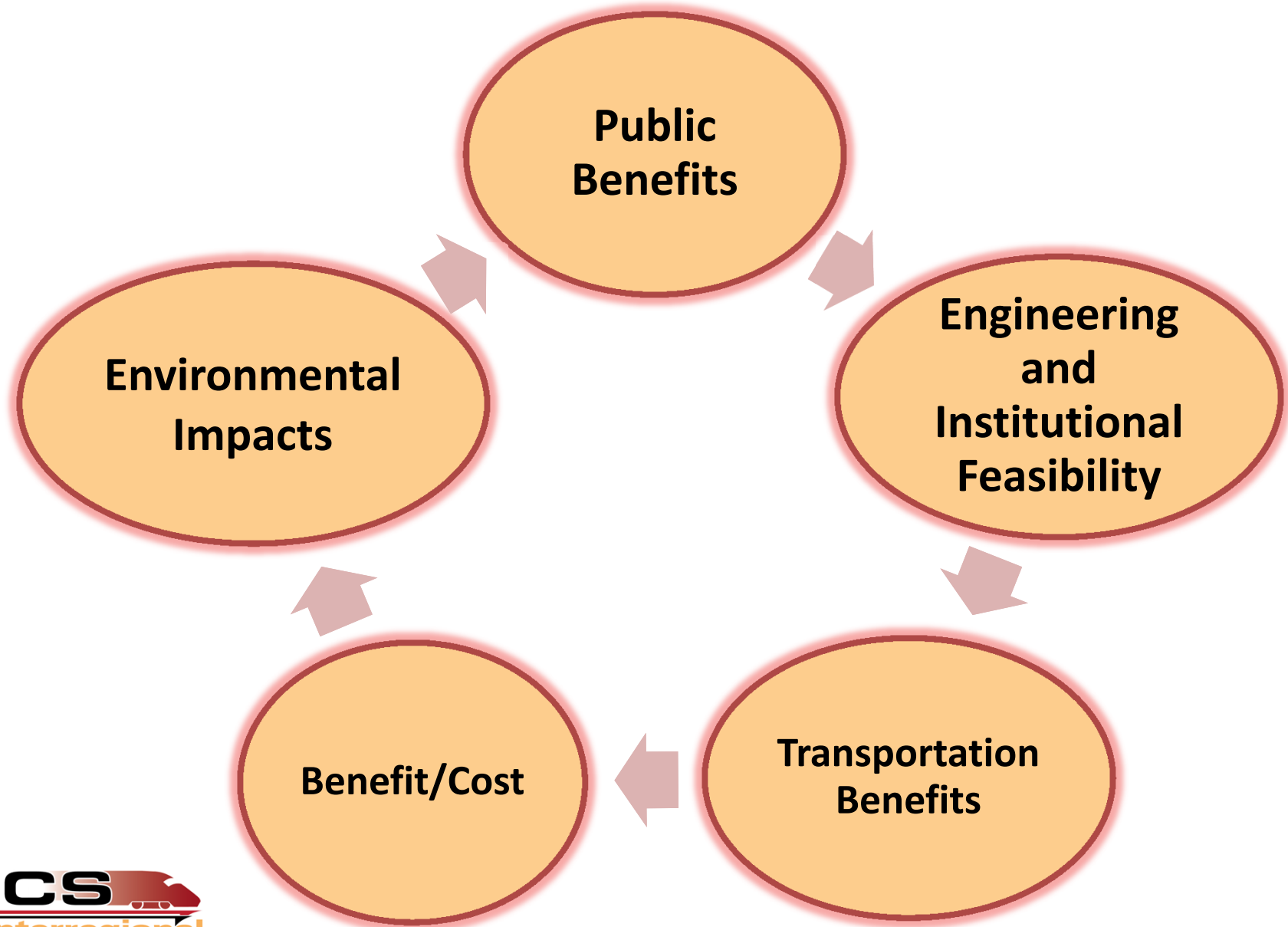
-Next Steps

Level 2 Evaluation Goals

- Maintain public support
- Select alignments north and south outside the Denver metro
- Define the best E-W alignments through the Denver metro
- Define the best alignment around the Denver metro area
- Identify general station locations



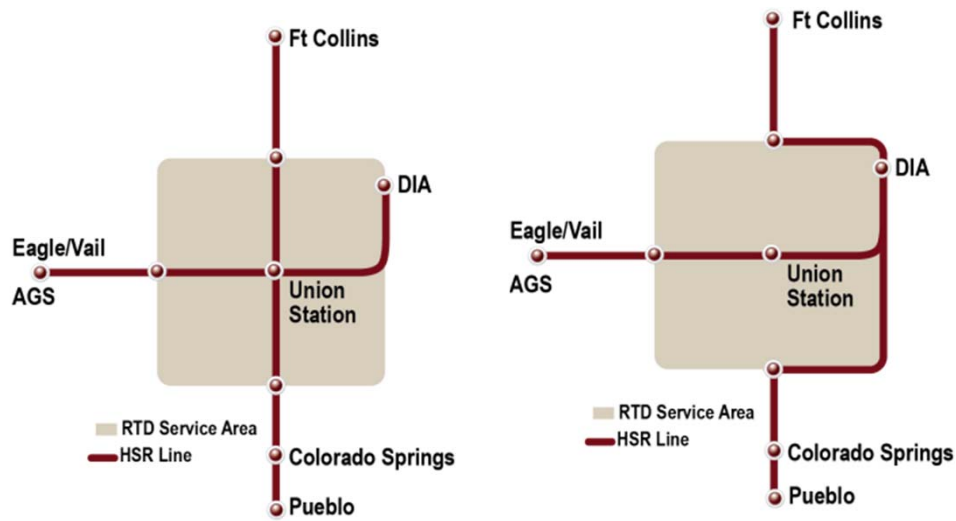
Level 2 Evaluation Criteria



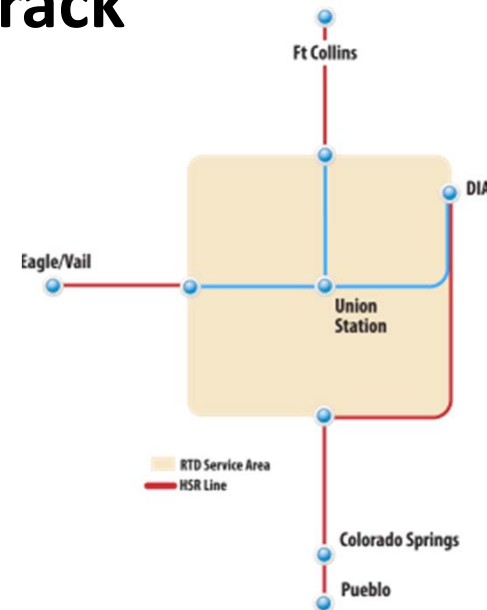
Level 2 Results



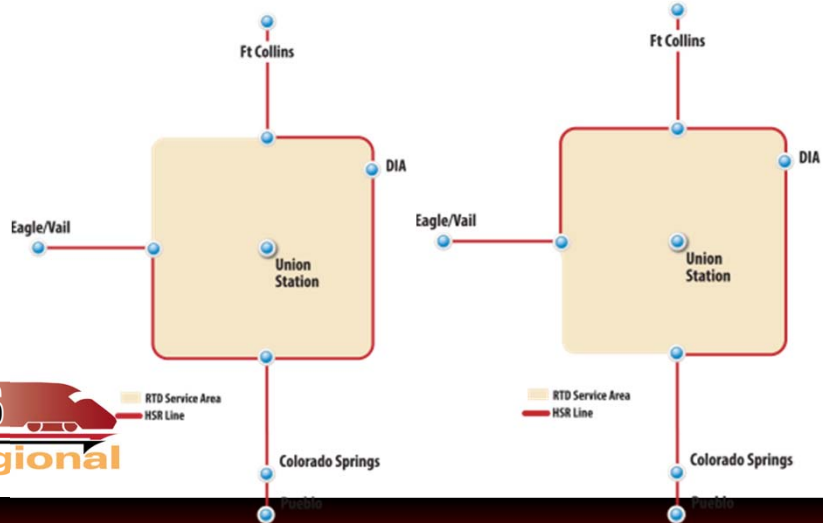
A-1 and A-5: Through Denver Options A (I-76) or B (US 6)



C-1: Shared RTD Track



B-2A and B-5: Around Denver

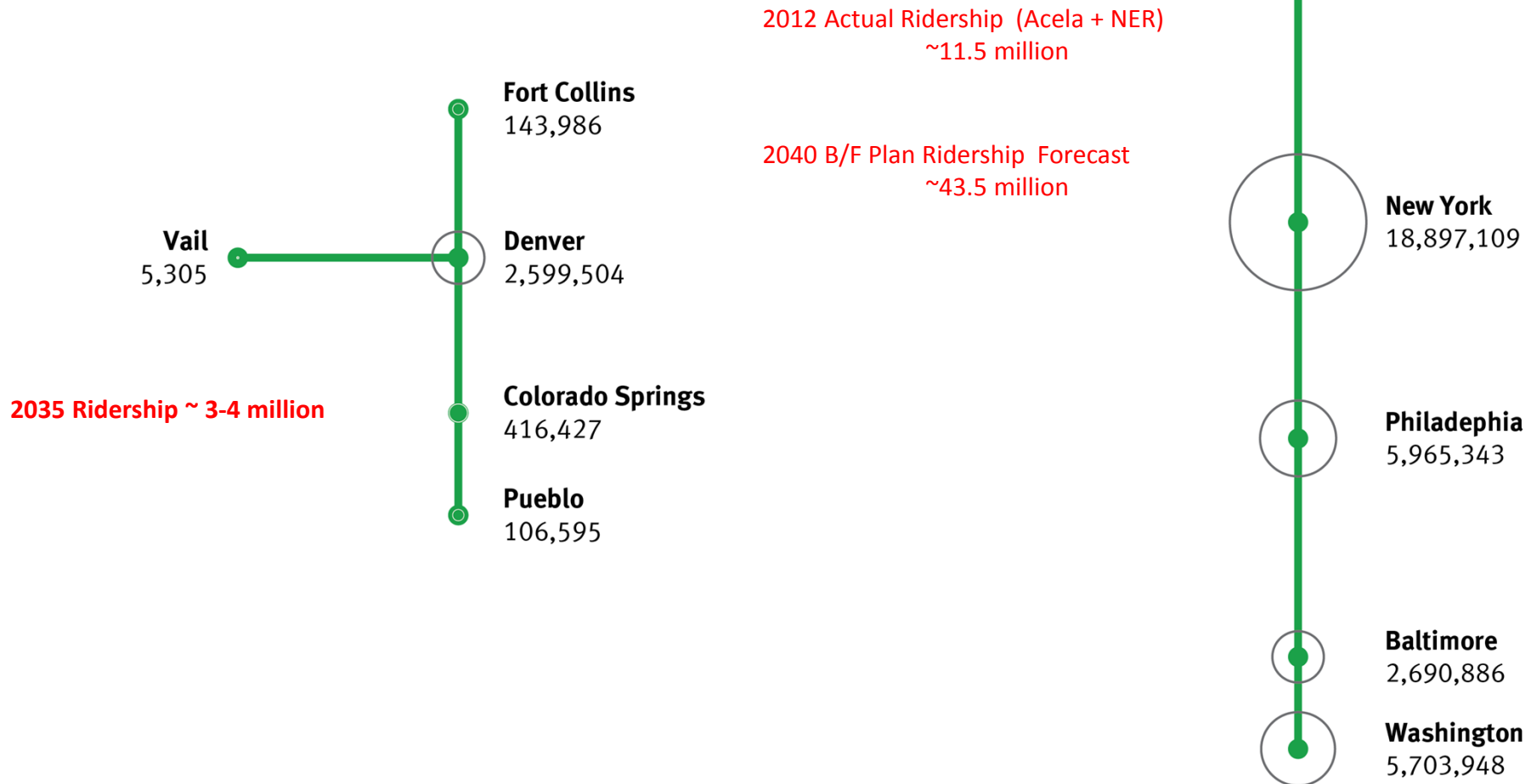




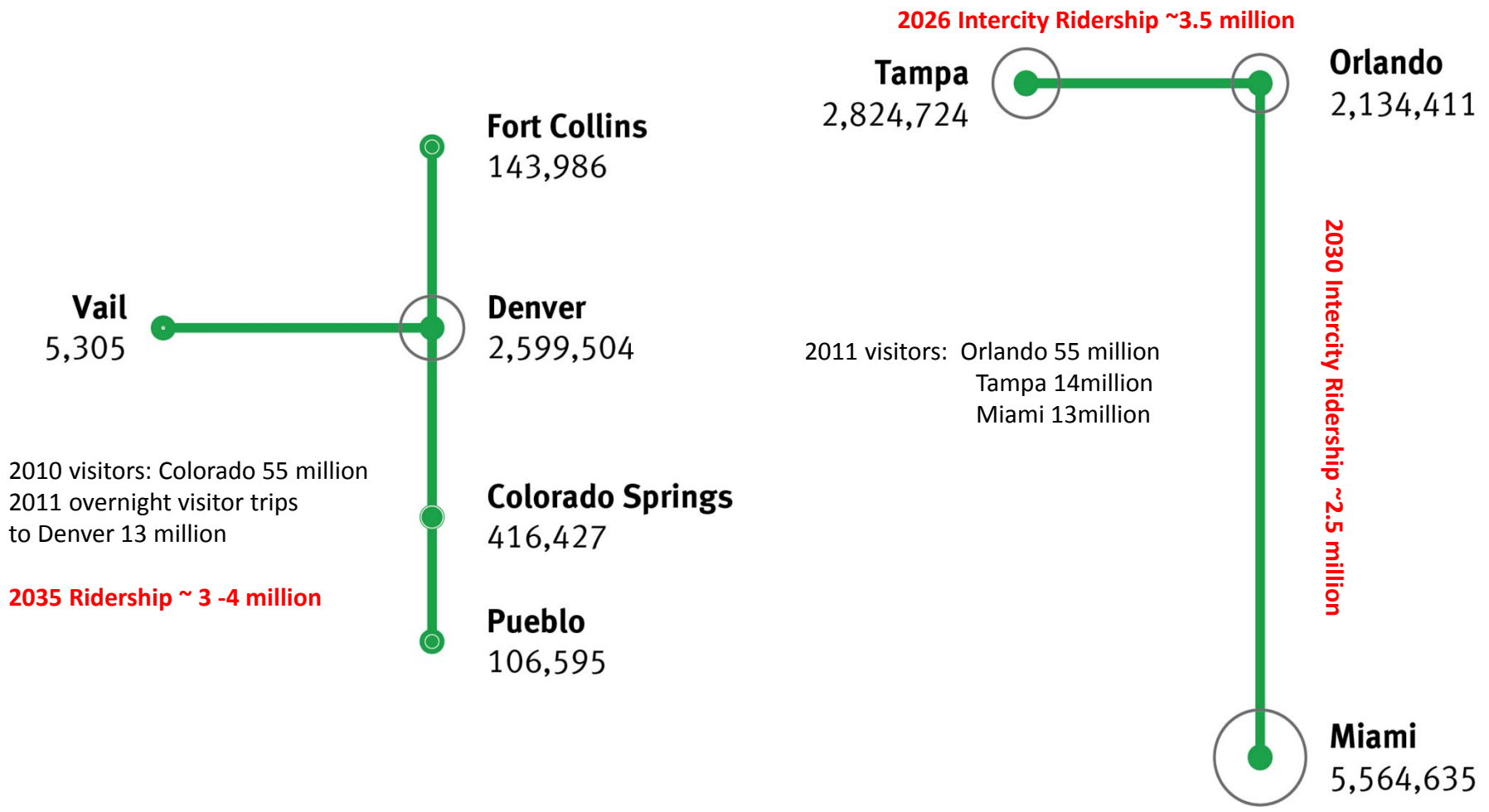
Performance by Scenario

Scenario	Ridership	Revenue
A1a	12,149,142	\$ 293,776,963
A1b	13,162,834	\$ 323,101,495
A5a	12,965,726	\$305,025,470
A5b	13,137,458	\$306,777,970
B2b	13,848,747	\$318,978,788
B5	13,714,955	\$310,293,016


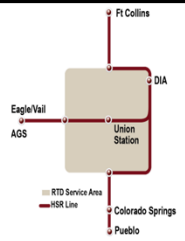
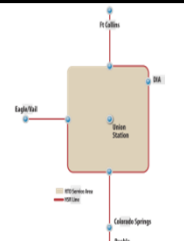
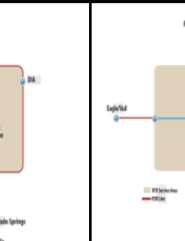

Ridership Benchmark Against HSR Corridors



Ridership Benchmark Against Other HSR Corridors



Distribution of Ridership by Scenario

Scenario	A1a	A1b	A5a	A5b	B2a	B5	C-1
Ridership							
Mountains	2,168,094	2,516,754	2,430,662	2,136,961	2,995,866	2,792,520	1,696,330
Percent of Total	17.85%	19.12%	18.75%	16.27%	21.63%	20.36%	15.64%
Mountain Daily	7,227	8,389	8,102	7,123	9,986	9,308	5,654
North of Denver	2,069,642	2,472,297	2,326,763	2,620,094	2,498,178	3,107,216	1,909,081
Percent of Total	17.04%	18.78%	17.95%	19.94%	18.04%	22.66%	17.60%
North Daily	6,899	8,241	7,756	8,734	8,327	10,357	6,364
South of Denver	5,451,251	5,674,676	5,584,849	5,514,986	6,220,862	5,596,993	4,994,421
Percent of Total	44.87%	43.11%	43.07%	41.98%	44.92%	40.81%	46.06%
South Daily	18,171	18,916	18,616	18,383	20,736	18,657	16,648
Denver Metro	2,460,154	2,499,106	2,623,452	2,865,417	2,133,840	2,218,226	2,244,474
Percent of Total	20.25%	18.99%	20.23%	21.81%	15.41%	16.17%	20.70%
Denver Daily	8,201	8,330	8,745	9,551	7,113	7,394	7,482
Total	12,149,141	13,162,833	12,965,726	13,137,458	13,848,747	13,714,955	10,844,306

Scenario Capital and Operating Costs

Scenario	CAPEX	OPEX
A-1: Direct through Denver	\$14.9 to \$15.6 B	\$183.0 M
A-5: Eastern Beltway	\$14.1 to \$14.3 B	\$186.0 M
B2A: Denver Periphery Excluding the NW Quadrant	\$13.4 B	\$205.0
B-5: Denver Periphery Excluding the Southwest Quadrant	\$13.9 B	\$207.0 M
C-1: Shared Track with RTD	\$11.5 B	\$189.2 M

Trip Type Breakdown by Scenario (ICS only)

Scenario	Intercity	Intra-Urban	Connect Air
A-1a (I-76)	84%	12%	4%
A-1b (US 6)	84%	12%	4%
A-5a (I-76)	75%	20%	5%
A-5b (US 6)	76%	19%	5%
B2a	77%	19%	4%
B5	75%	21%	4%
C-1	78%	16%	6%

How Environmental Impacts Affect Results

▶ North to Fort Collins

- Impacts of N1 (EIS) are too great on Longmont, Loveland and Fort Collins
- The impacts of N2 (I-25) are minimal due to its location in the I-25 median

▶ Through the Denver Area

- Segments through Denver have high impacts and are likely not implementable
- Beltway segments around Denver have fewer issues and could be implemented

▶ South to Colorado Springs/Pueblo

- Since there is only one basic alignment the emphasis will be to mitigate anticipated impacts
- Impact challenges are anticipated through Castle Rock and Colorado Springs, as well as streams and floodplains between Castle Rock and Monument

Alignments **through** Denver

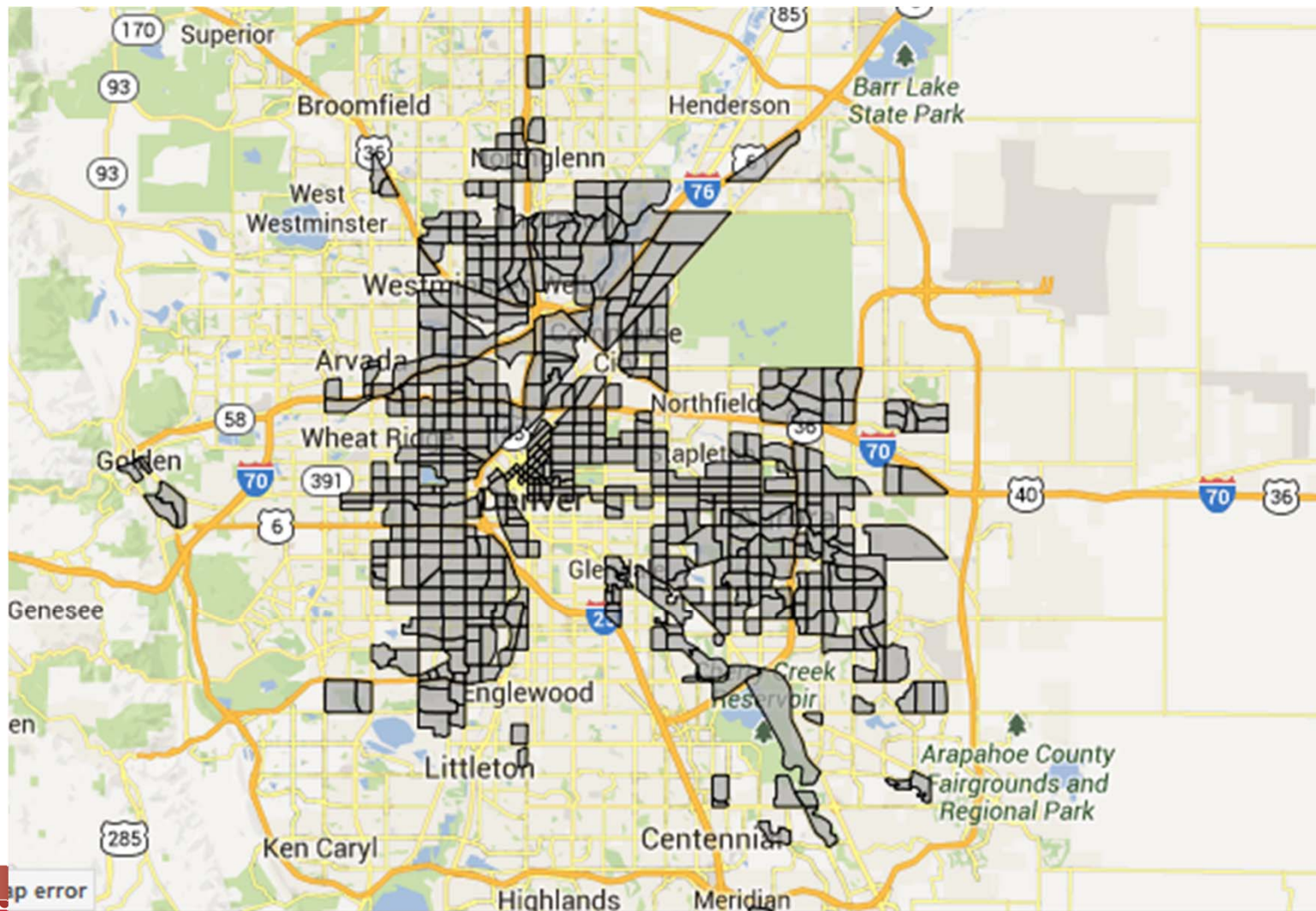
- ▶ High speeds present concerns for noise and vibration
- ▶ High right-of-way needs along developed corridors, particularly:
 - US 6 alignment for Scenarios A-1 and A-5
 - Around Denver Union Station for Scenario A-1
 - Along the freight railroad/Santa Fe corridors through central Denver (40th Ave to Evans Ave) for Scenario A-1
- ▶ Established residential neighborhoods, especially west of I-25 and east of Sheridan/Wadsworth
 - Low Income and Minority Communities
 - Historic Properties and Neighborhoods
 - Cumulative Impacts of Multiple Transportation Facilities through Communities
- ▶ Planned development and neighborhoods in Commerce City along 96th Ave

Alignments **around** Denver




- ▶ Less dense residential development
- ▶ Right-of-way within transportation corridors
- ▶ Ecological/park/open space impacts, especially along west perimeter alignments (southwest and northwest quadrants)
- ▶ Concerns regarding northwest quadrant in Golden area






Distribution of Minority/Low Income Populations in Denver Metro Area



Comparison of Community/Environmental Impacts East - West Options through Denver

	I-76 through Denver 	US 6 through Denver 	Beltway north around Denver 
Community Disruption	8.3 linear miles	11.32 linear miles	7.02 linear miles
Parks	5 parks + RMA 4.84 linear miles	7 parks + RMA 5.35 linear miles	9 parks/open space 6.73 linear miles
Historic	Medium	High	Low
Environmental Justice	Medium/High	High	Low
Stream Crossings	13 crossings 1.5 linear miles	12 crossings 0.55 linear miles	13 crossings 0.71 linear miles

Comparison of Community/Environmental Impacts North-South Options through Denver

	Railroad/ Santa Fe Corridor 	Beltway east around Denver 	Beltway west around Denver 
Community Disruption	12.79 linear miles	5.05 linear miles	9.98 linear miles
Parks	1 park 0.15 linear miles	None	12 parks 11.28 linear miles
Historic	Medium/High	Low	Low
Environmental Justice	High	Low	Low
Stream Crossings	9 crossings 1.30 linear miles	11 crossings 0.49 linear miles	20 crossings 0.76 linear miles

Benefit Cost Ratio



What Are the Components of the BCA?

Benefits

1. Ticket Revenue
2. Reductions in VMT
3. Reductions in travel delay
4. Fatalities avoided
5. Air Quality
6. Temporary and permanent employment
7. Influx of federal grant money
8. Multiplier effects

Costs

1. Capital Cost
2. Interest on bonds
3. Operation and Maintenance Costs



Early B/C Conclusions

- ▶ Operating ratio and B/C is positive for the ICS system
 - Does not include Mountain Corridor yet

- ▶ B/C is driven by:
 - Impact of the interest rate assumed
 - Fare box revenue
 - Construction employment
 - Operations employment
 - Effects of and influx of federal funding



Preliminary B/C Calculations

B/C Element	A-1a	A1b	A-5a	A-5b	C-1	B-2A	B-5
Total Benefits	\$48.2 B	\$47.7 B	\$44.8 B	\$45.4 B	\$37.3 B	\$43.8 B	\$44.8 B
Total Costs	\$24.5 B	\$23.5 B	\$22.4 B	\$22.7 B	\$18.9 B	\$22.5 B	\$22.5 B
B/C Ratio	1.97	2.03	2.00	2.00	1.97	2.01	1.99
Operating Ratio	1.32	1.45	1.32	1.35	1.05	1.21	1.19



Revenues and Financing Options

Why Is This Important?

- ▶ All scenarios will require a significant local funding contribution
 - Perhaps \$80-\$100 million/year for an initial phase (MOS)
- ▶ The higher level of local funding the better the chance to:
 - Receive a federal grant
 - Attract private funding
- ▶ The public will need to support some form of revenue increase
- ▶ Without public support the HSIPR project will not be implemented

How Much Money Would a First Phase Require?

- ▶ HSIPR would need to be phased over many years due to the cost
- ▶ Once a first phase was proven feasible future phases would be easier to fund
- ▶ Assume a Phase 1 of 60 miles
 - Capital cost = ~\$2.4 Billion
 - Interest at 4%
 - Payment = ~\$137.1 Million/year
 - Federal share = ~\$68.6 Million/year
 - State and other share = ~ **\$68.6 Million/year**

Where Does the Money Come From For HSIPR Projects?

Conventional Sources

- Motor Fuel Taxes
- Vehicle Registration Fees

Other General Government

- Sales Taxes
- Income Taxes
- Property Taxes
- Profits from Lottery Sales

Other sources

- Farebox Revenues
- Value Capture Mechanisms (Fees)
- Vehicle Miles Travelled (VMT) Fees
- Utility Fees
- Lodging (or other Visitor Fees)
- Private/Public Private Partnerships



What Are Some Possible Way To Fund The \$69 M Required?

Sources	Increase / Change	Revenues Generated (M \$/year)
<u>User Fees</u>		
Farebox Revenues	\$0.35/mile	\$320.0
Motor Fuel Purchase Tax Increase	\$.25 per gallon	\$446.9
VMT Fees	\$.01 per mile	\$392.9
Increase in Vehicle Registration Fees	\$100 per vehicle	\$391.3
Utility Fees	\$15 per month/hh	\$293.6
<u>General Revenues</u>		
Increased State Sales Tax	1%	\$571.9
Increased State Property Tax	4 mills	\$200.1
Increased State Income Tax	1%	\$1,044.1
Lodging Tax	1% statewide lodging spending	\$26.5
Change in Lottery Tax Allocation	10% of lottery profits	\$11.3
<u>Value Capture Mechanisms</u>		
Development Fee	\$10,000/residential 1% fee/ commercial	\$169.4

Next Steps For Level 3 Evaluation

▶ Planning Studies

- Better define and mitigate high impacts
- Refine the service plan to optimize service and improve cost-effectiveness
- Refine the OPEX estimate with specific technology based unit costs.

▶ Engineering Studies

- Make recommendations for a preferred technology
- Value engineer the remaining scenarios to improve cost-effectiveness
- Better define ROW requirements
- Revise CAPEX to account for engineering refinements
- Prepare a phasing strategy

▶ Third Round of Public Open Houses – early Fall

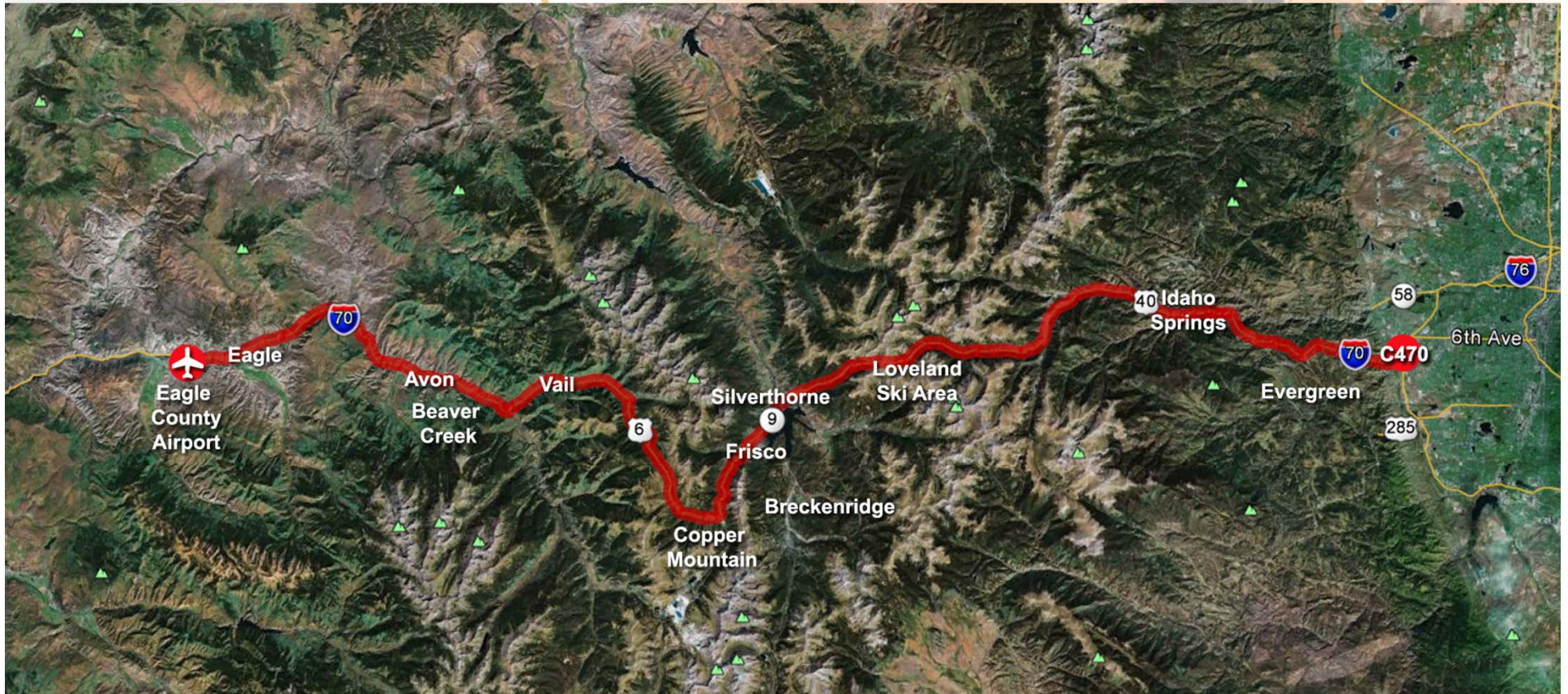
Tonight: What are your thoughts.....

- ▶ What is your opinion on the 5 scenarios?
- ▶ What weighs heaviest – higher ridership or fewer environmental/community impacts?
- ▶ Do you have thoughts on other revenue sources?
- ▶ Other comments or concerns



*CDOT Advanced
Guideway System
(AGS) Feasibility Study
Update*

Location of AGS I-70 Mountain Corridor (six stations)



AGS Project Goal

- ▶ To find a feasible and implementable high speed transit system to ultimately link Denver International Airport and Eagle County Regional Airport, following the I-70 alignment
- ▶ This system will serve the recreational, business and commuter needs of the corridor
- ▶ This system will also reduce the amount of truck traffic on the corridor



Study Progress to Date:

- ▶ Feasible Technologies Identified
- ▶ Station Location Discussions Held With Mountain Corridor Counties
- ▶ Alignment Alternatives Developed
- ▶ Preliminary Ridership Estimates Completed
- ▶ On-Going Cost Estimating (Capital & O&M)
- ▶ Assessing Financial Feasibility
- ▶ Planned Completion in Early Fall 2013



Possible AGS Technologies

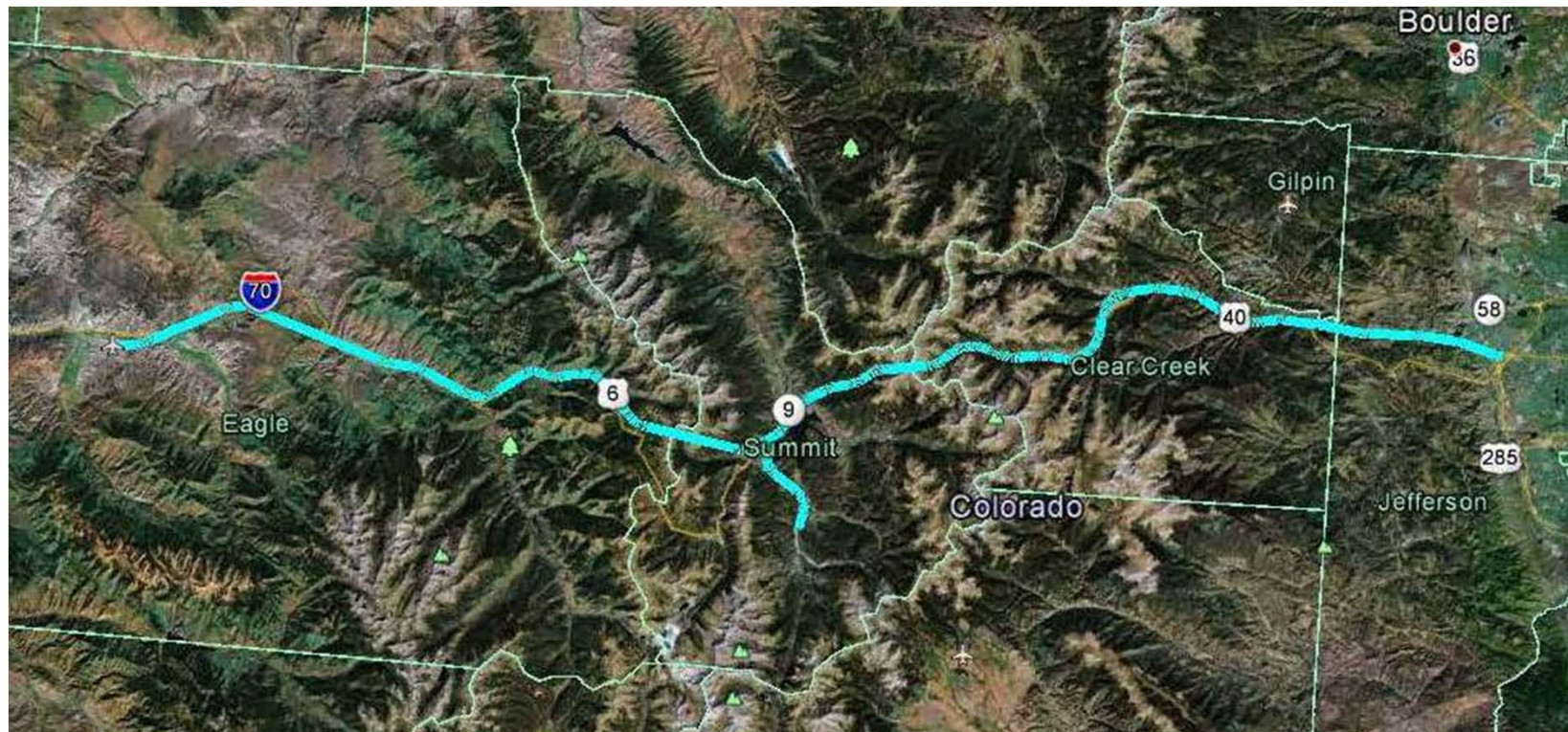
▶ High Speed Steel Wheel on Steel Rail

- Travel Time from Golden to Eagle County Regional Airport (ECRA) – 71 minutes
- Ridership – 3.4 Million Riders Per Year (Origin or Destination in I-70 Mountain Corridor)
- 108.9 Miles, 65.0 Miles in Tunnels
- Preliminary Cost - \$31.92 Billion



Possible AGS Technologies

- ▶ High Speed Steel Wheel on Steel Rail



Possible AGS Technologies

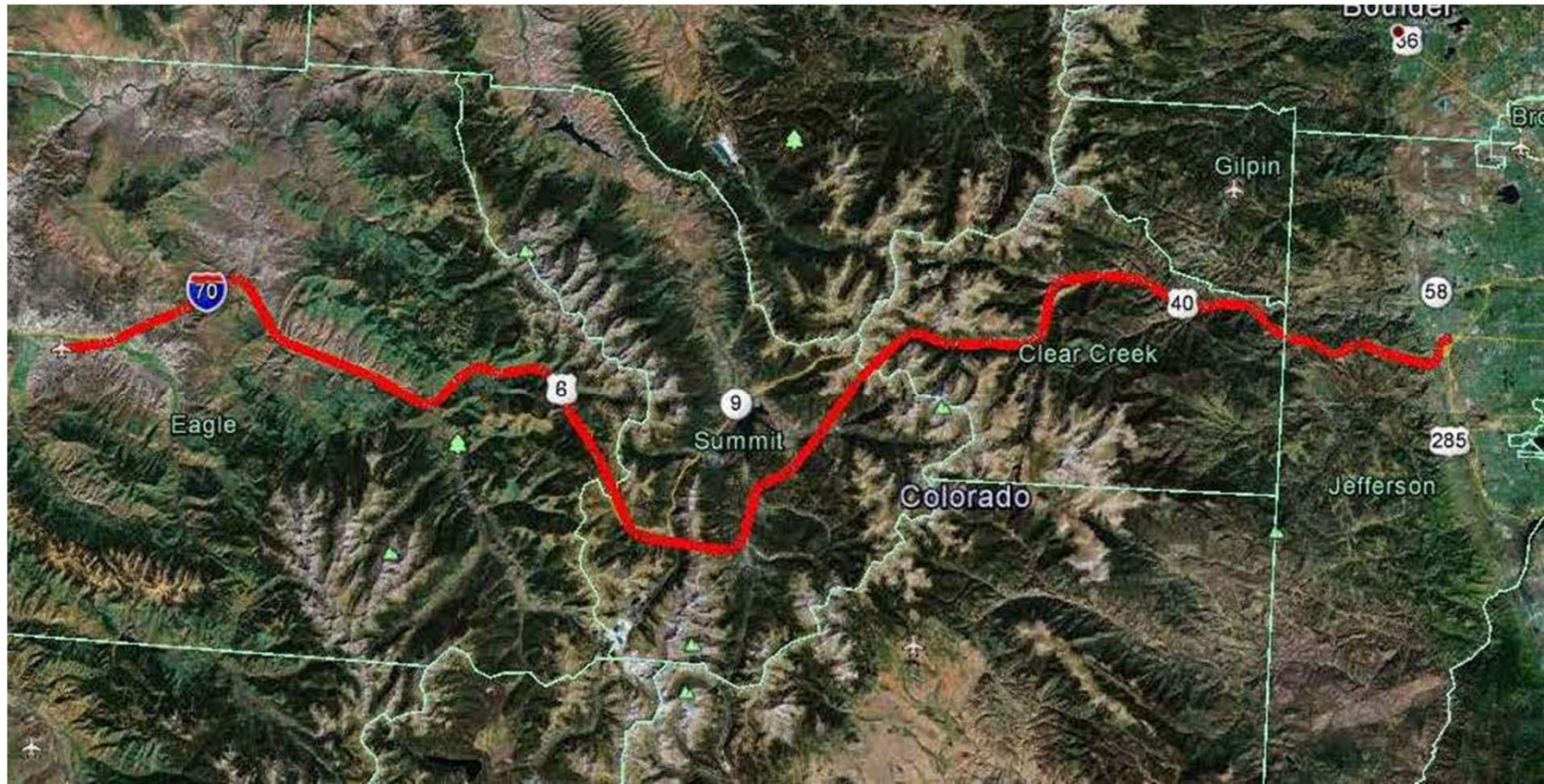
High Speed Maglev

- Travel Time from Golden to Eagle County Regional Airport (ECRA) – 79 minutes
- Ridership – 3.3 Million Riders Per Year (Origin or Destination in I-70 Mountain Corridor)
- 118.5 Miles, 40.1 Miles in Tunnels
- Preliminary Cost - \$25.0 Billion



Possible AGS Technologies

High Speed Maglev



Possible AGS Technologies

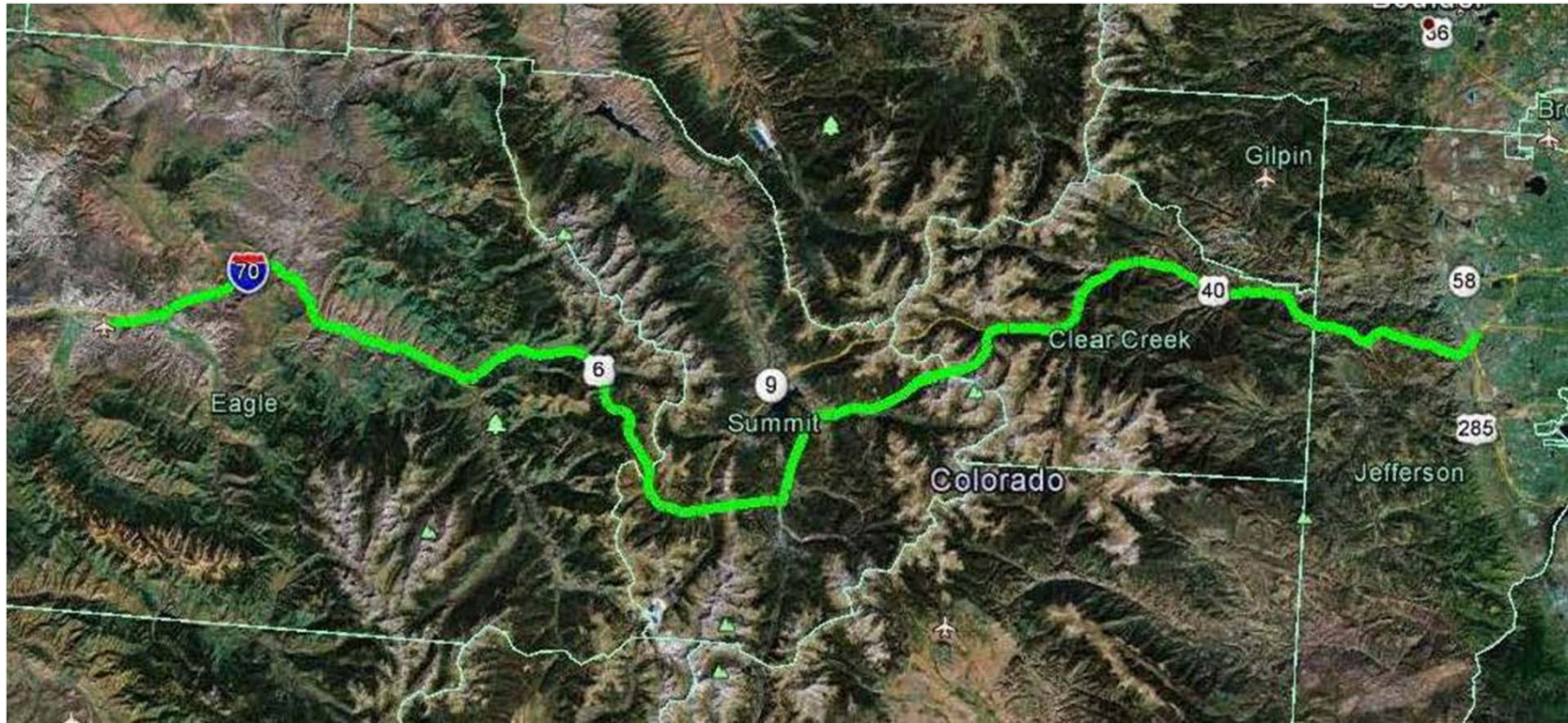
120 MPH Maglev

- Travel Time from Golden to Eagle County Regional Airport (ECRA) – 106 minutes
- Ridership – 3.0 Million Riders Per Year (Origin or Destination in I-70 Mountain Corridor)
- 120.5 Miles, 15.7 Miles in Tunnels
- Preliminary Cost - \$11.0 Billion



Possible AGS Technologies

▶ 120 MPH Maglev



On Going AGS Activities

- ▶ Develop Technology Specific Operation and Maintenance (O&M) Costs
- ▶ Determine Operating Ratios Based on Farebox Revenue & O&M Costs
- ▶ Determine Benefit/Cost Ratios for Various Technologies
- ▶ Assess Financial Feasibility
- ▶ Draft and Final AGS Feasibility Study

Extra Slides





Methodologies

- Ridership*
- Capital Costs*
- Operating Costs*

Ridership Methodology

- ▶ Open, non-proprietary forecasting models
- ▶ Use of DRCOG and other MPO models and data to represent
 - Connectivity with RTD
 - Socio-economic and transportation characteristics of urban areas
- ▶ New local data collected to
 - Purchase of “cell phone” data
 - Conduct a “stated preference survey”
- ▶ Information exchange and documentation
 - Interactions with MPOs, stakeholders and modelers
 - Memos/reports on model development and application to come

Stated Preference (SP) Survey

- ▶ Internet-based SP survey conducted in December 2012
 - Data from local residents
 - About 1000 completed surveys

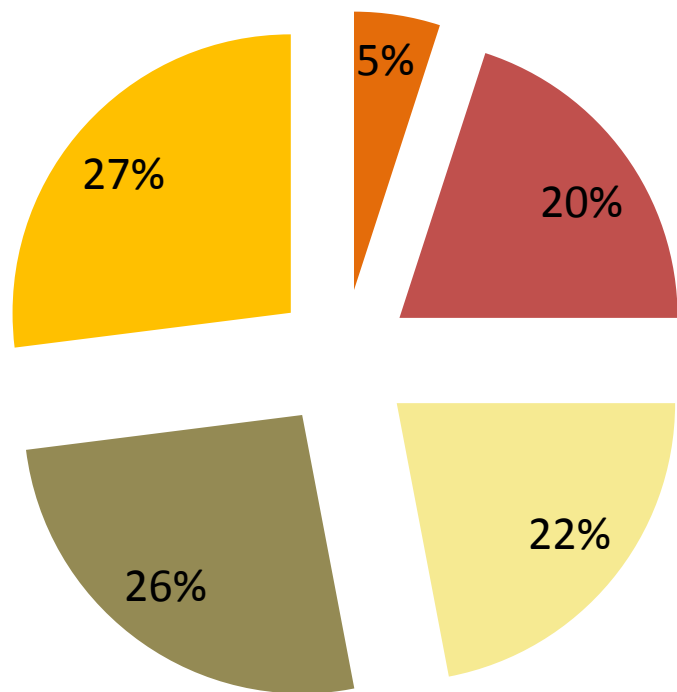
- ▶ Survey respondents recruited using market research firm

- ▶ Stated preference alternatives
 - Current auto travel option
 - Auto travel with tolled facility
 - AGS/Train travel

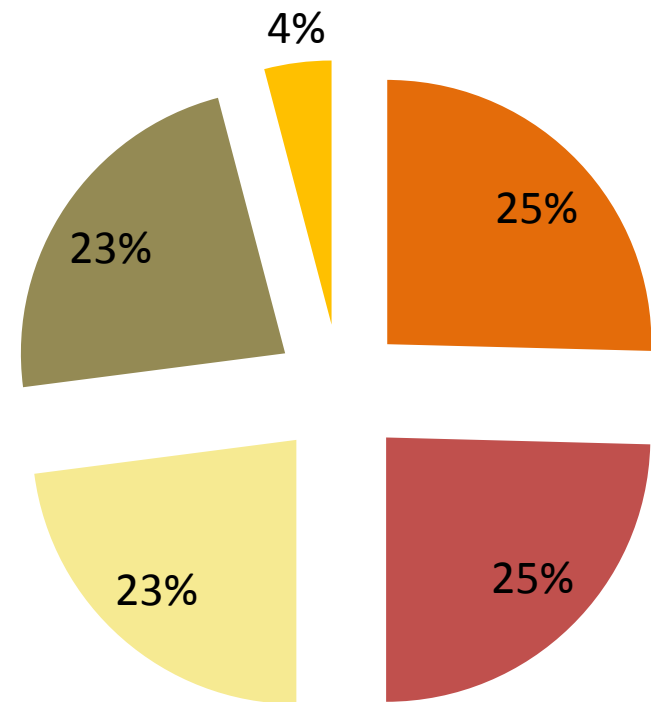


SP Survey shows support for AGS/Train

Opinion: tolls on I-25 and I-70



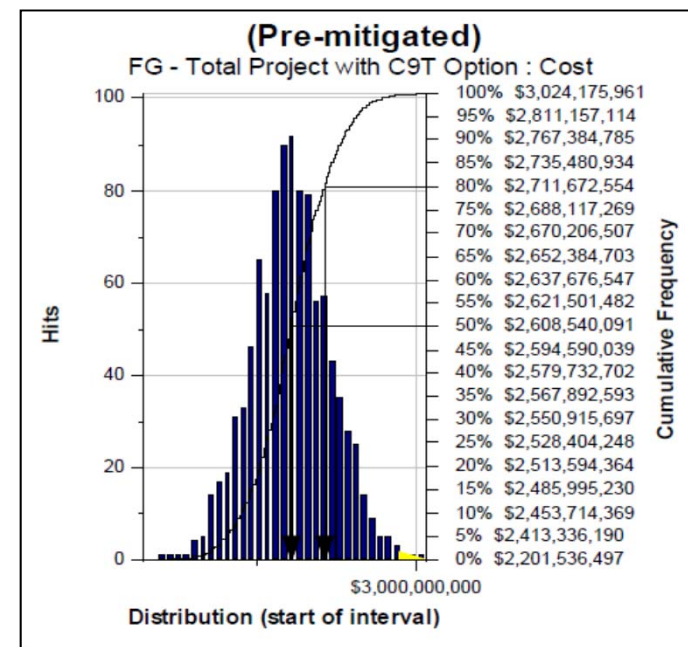
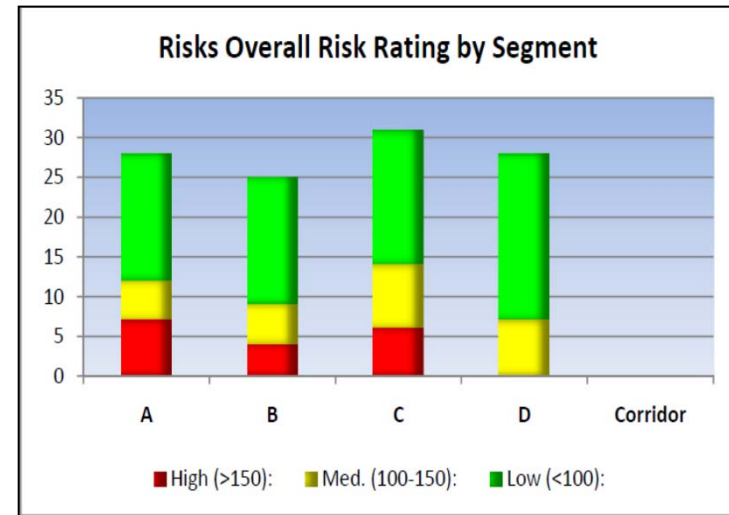
Opinion: new AGS/Train



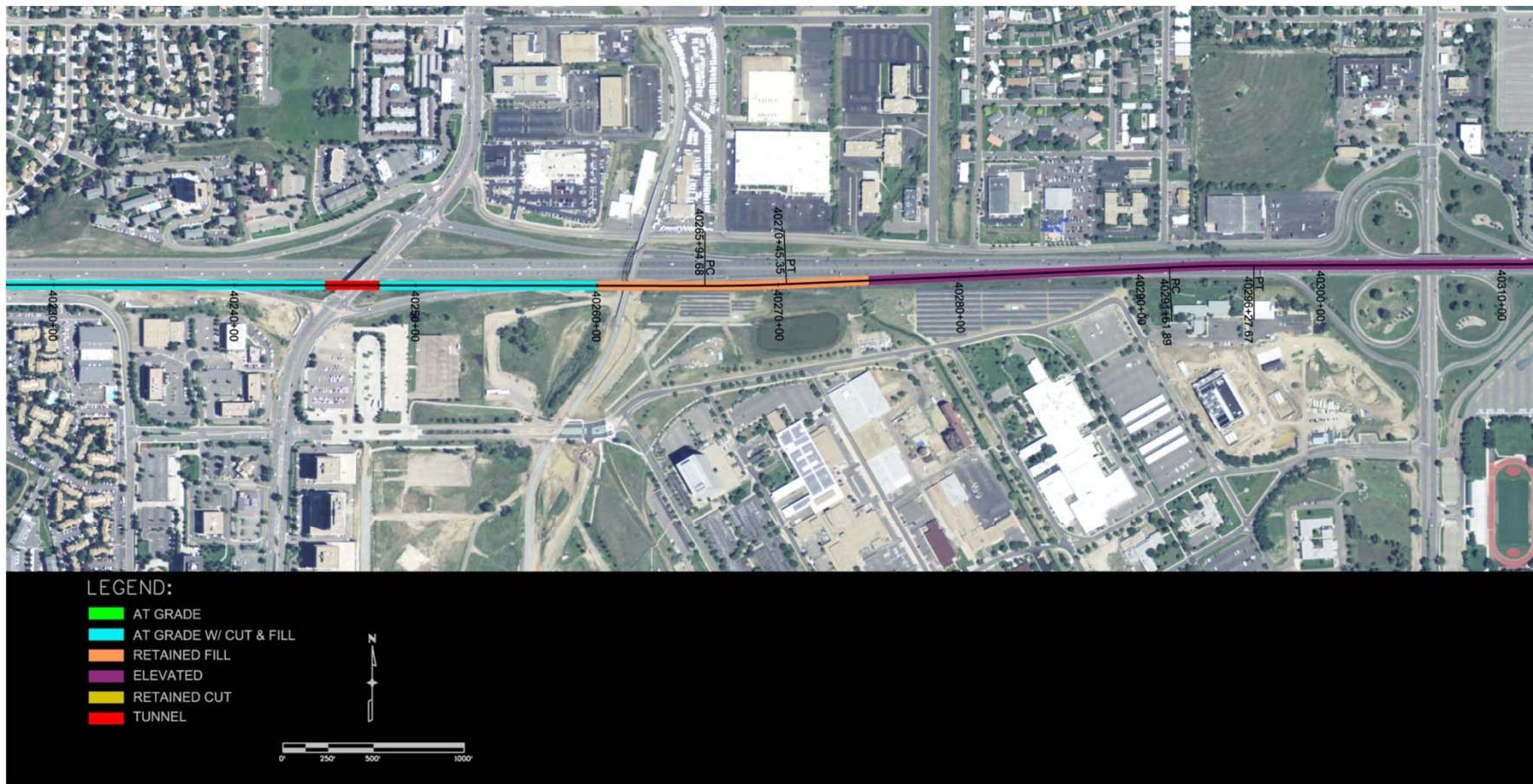
- Strongly favor
- Somewhat favor
- Neutral
- Somewhat oppose
- Strongly oppose

CAPEX Methodology

- CAPEX Methodology Manual was developed at Level 1
- Standard Cross Sections were developed for
 - Track at grade
 - Track on retained fill
 - Track on structure
 - Track in Tunnel
- Unit Prices were developed for each standard cross section
- Unit price is multiplied by the length of a standard cross section within a given segment



Example of Quantity Measurement



OPEX Methodology

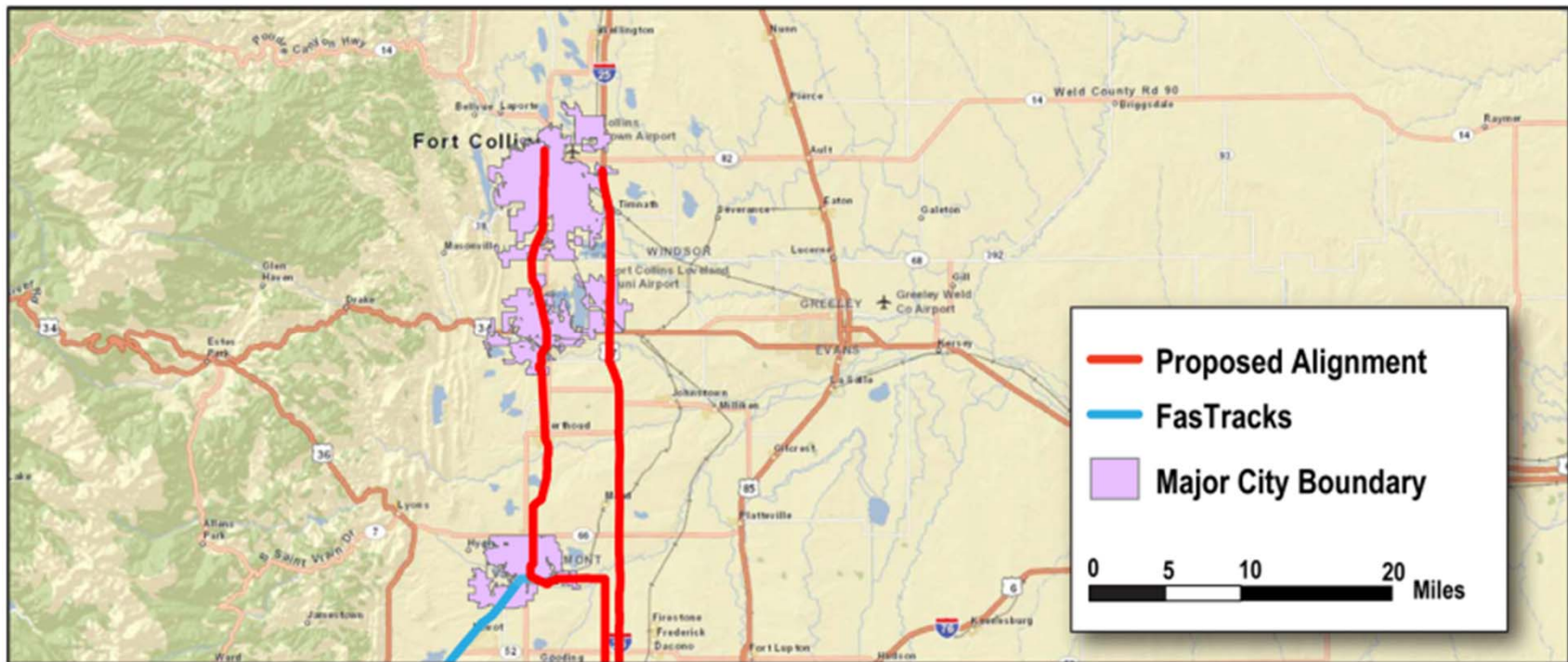
- ▶ Develop Service Plan Assumptions (# of trains/day)
- ▶ Calculate Train Miles for each Service Plan
- ▶ Multiply Train Miles by the Unit Cost for each technology
- ▶ Litmus test Basic and Capacity Scenarios

$$\text{OPEX} = (\text{Train miles/ day}) \times (\text{Days of operation}) \times (\$/\text{mile})$$

Environmental Impact Methodology

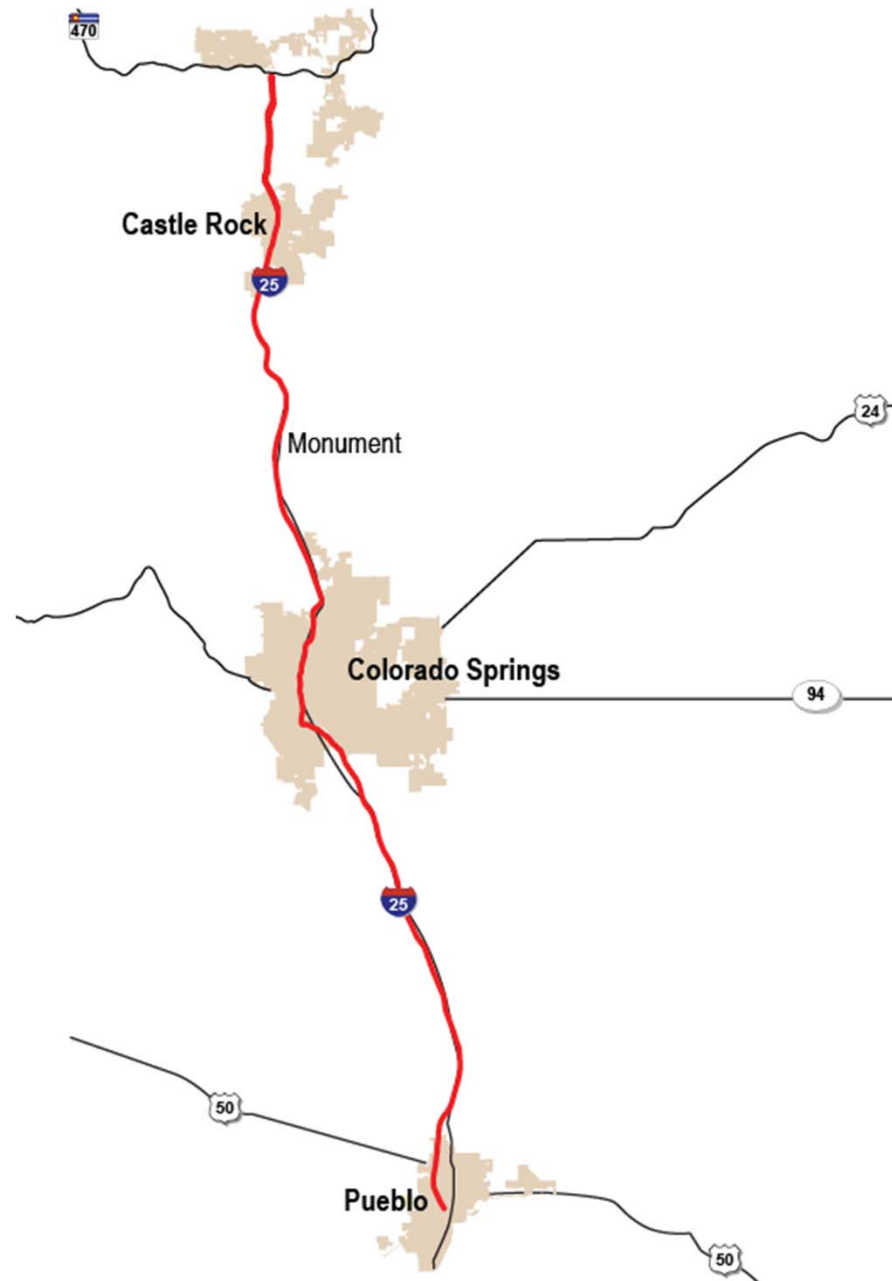
- ▶ Important environmental resources were identified from available mapping
- ▶ Engineering alignments were developed and compared to mapped resources – high level
- ▶ Typical construction footprints were developed for
 - Track
 - Stations and support facilities
 - Acres of disturbance calculated
- ▶ Four PLT meetings were held to discuss issues

Two Segments To Fort Collins



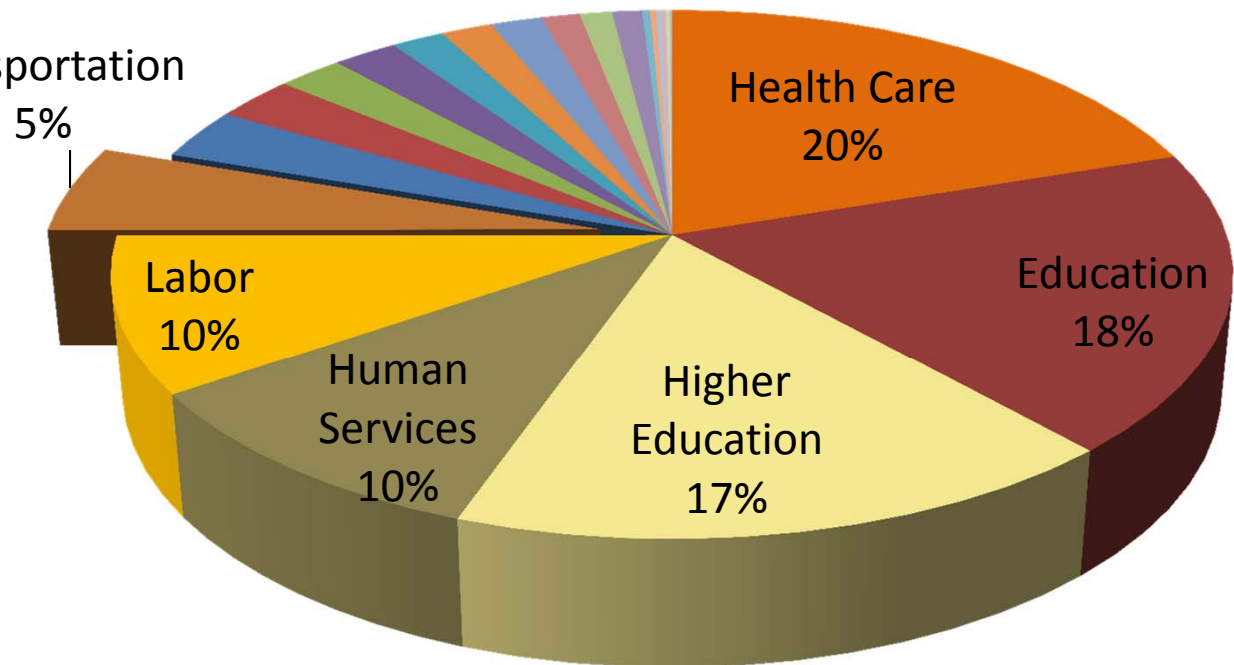
One Segment Remained to Colorado Springs & Pueblo



The Black Forest segment (S1) east of COS was strongly opposed and eliminated in Level 1 Evaluation



Transportation Is A Small Part Of The State Budget (Fiscal Year 2010-2011)

- ▶ \$25 billion budget
- ▶ 22 departments
- ▶ Largest departments: Health Care & Education
- ▶ Transportation is about 5% of overall state budget at \$1.3 billion



	<p>N:1: Railroad Alignment (I-25 North EIS Commuter Rail)</p> 	<p>N2: I-25 Alignment</p> 
Community Disruption	10.80 linear miles directly adjacent to residential/mixed use	No residential/mixed use within 1,000 feet of alignment
Parks	<ul style="list-style-type: none"> • 8 potentially affected properties • 4.62 linear miles adjacent to parks 	<ul style="list-style-type: none"> • 3 potentially affected properties • 0.88 linear miles adjacent to parks
Historic	<ul style="list-style-type: none"> • Two National Register listed properties potentially affected • Developed areas than 50 years old 	No historic properties within CDOT right-of-way.
Environmental Justice	Low income/minority populations adjacent to the US 287 corridor in corridor communities	Some populations exist north of Timnath but far from alignment
Stream Crossings	<ul style="list-style-type: none"> • 12 stream crossings • 2.77 linear miles of streams adjacent to alignment 	<ul style="list-style-type: none"> • 12 stream crossings • 0.15 linear miles of streams adjacent to alignment