Interregional Connectivity Study
Level 1 Evaluation Report

DOT
DEPARTMENT OF TRANSPORTATION

CDOT Division of Transit and Rail

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ICS Interregional Connectivity Study

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Executive Summary

Why is CDOT Conducting this Study?

On June 23, 2009, the Federal Railroad Administration (FRA) issued a Notice of Funding Availability for the High-Speed Interregional Passenger Rail (HSIPR) Program in the Federal Register. In response, CDOT, in concert with the Denver Regional Transportation District (RTD), submitted an application to conduct the Colorado Interregional Connectivity Study (ICS).

The Rocky Mountain Rail Authority (RMRA), a governmental authority made up of over 50 local governmental entities, completed a High-Speed Interregional Passenger Rail (HSIPR) Feasibility Study in March 2010 that examined HSIPR along the Front Range from Cheyenne, Wyoming to Trinidad, Colorado and along the I-70 Mountain Corridor from Denver International Airport (DIA) to Grand Junction, Colorado.

The RMRA study concluded that HSIPR is feasible within FRA guidelines on an I-25 north-south corridor from Fort Collins to Pueblo and on an I-70 east-west corridor from DIA to the C-470/I-70 interchange in Jefferson County. The most feasible segments and technology were identified for the purpose of ascertaining the most favorable cost-benefit ratio, but no specific segment or technology was selected or recommended in the study.

The RMRA study did not consider the environmental and political feasibilities of these recommendations, nor did it evaluate the interconnectivity of HSIPR with the RTD FasTracks program or other transit in Colorado.

Lastly, the RMRA study assumed that the freight rail through Denver on the Consolidated Main Line (CML) would be moved to a new corridor on the eastern plains, something that is no longer expected to occur in the near future.

To help address these issues, and to take the level of analysis a step further, the RMRA study recommended the ICS as one of the key next steps toward implementing HSIPR in Colorado.

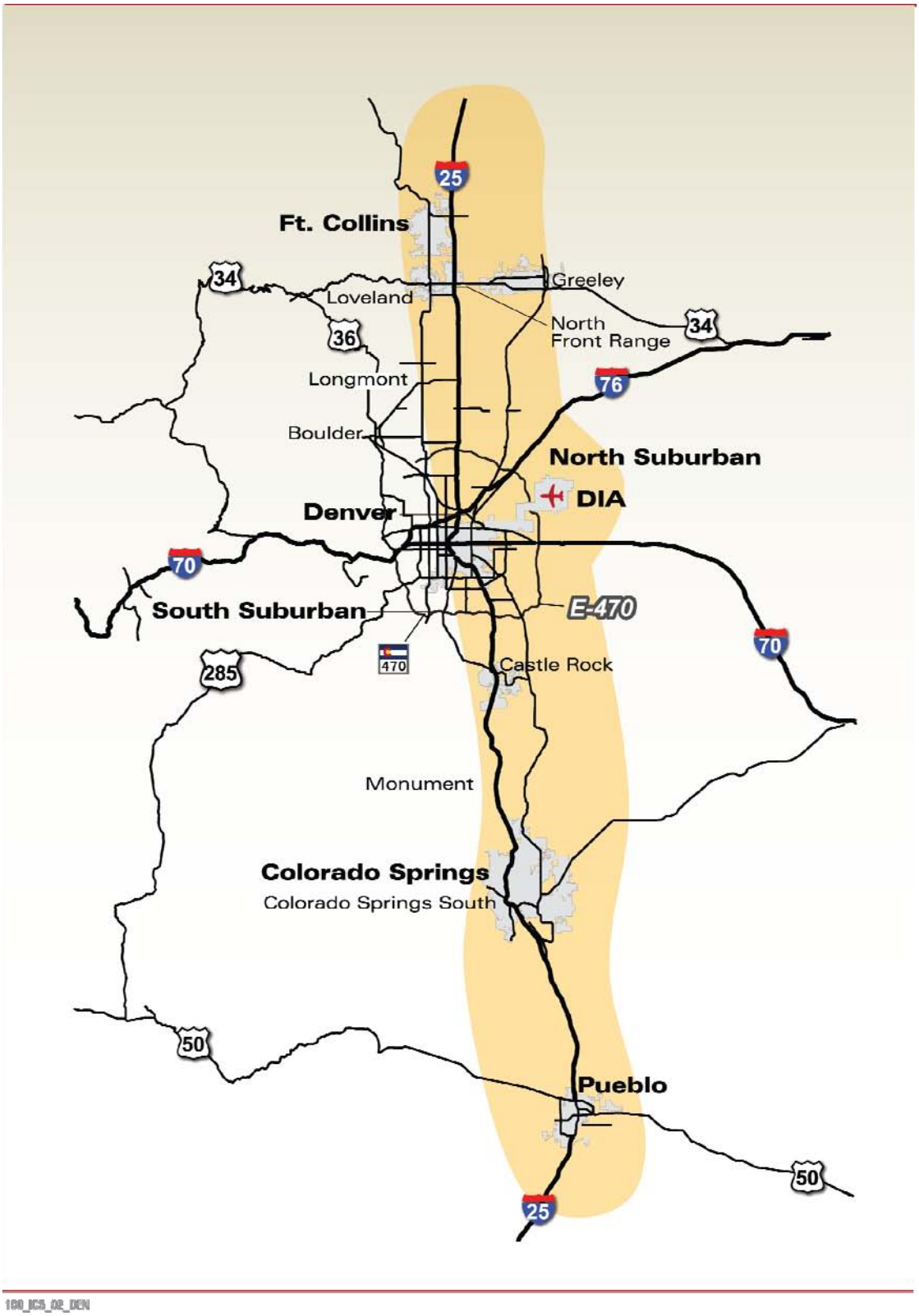
What is the ICS Study Area?

The study area for the ICS is shown in **Exhibit ES-1**. The study limits are DIA to the east, the C-470/I-70 interchange to the west, the City of Fort Collins to the north, and the City of Pueblo to the south.

The Objectives of the Interregional Connectivity Study are to:

- Serve as a planning document and provide preliminary recommendations for HSIPR segments, technologies, and station locations in the Denver metropolitan area that would maximize ridership for the existing and proposed RTD FasTracks transit system and future HSIPR service.
- Identify potential future HSIPR connections with the RTD FasTracks system.
- Determine optimal locations for a north-south (Front Range corridor) HSIPR segment from Fort Collins to Pueblo and an east-west HSIPR segment from DIA to the C-470/ I-70 interchange in Jefferson County.

EXHIBIT ES-1
ICS Study Area



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What Do We Mean by High-Speed Rail?

As described below, HSIPR is different than commuter rail, light rail, or streetcar projects that have been sponsored in Colorado in the recent past.

The FRA defines high-speed rail using several categories, described in **Exhibit ES-2**.

EXHIBIT ES-2
Federal Railroad Administration (FRA) Definition of High-Speed Rail Categories

Category	Service	Top Speeds/ROW	Purpose
High Speed Rail (HSR) Express	Frequent service between major population centers from 200 to 600 miles apart	At least 150 miles per hour (mph) on dedicated right-of-way (ROW)	Relieve air travel and highway capacity constraints
HSR Regional	Relatively frequent service between major and moderate population centers from 100 to 500 miles apart	110 to 150 mph on grade-separated track, and some shared track, with some intermediate stops	Relieve highway and, to some extent, air travel capacity constraints
Emerging HSR	Located in developing corridors from 100 to 500 miles apart with a strong potential for future HSR Regional or Express service	90 to 110 mph with either advanced grade protection or grade separation	Develop the passenger rail market and provide some relief to other travel modes
Conventional Rail	Traditional intercity passenger rail service of more than 100 miles with as little as one to as many as 12 daily runs; conventional rail may or may not have the potential for future HSIPR service	Top speeds between 79 mph and 90 mph, generally on shared track	Provide travel options and develop passenger rail markets for future development

How Does this Report Support the ICS?

This Level 1 Evaluation Report is the first of four planning documents that will be prepared for the ICS. Sequential reports will be prepared at increasing levels of detail for the Level 2 Evaluation and Level 3 Evaluation.

A Final ICS Report will be prepared to document the entire planning and decision-making processes and record the study team recommendations.

As the first step in the process, this Level 1 Evaluation report documents the initial findings for determining the feasibility of HSIPR in Colorado. Building from the RMRA report and other recent transportation planning studies done for the Denver metropolitan area, this report focuses on identifying possible segments for a future HSIPR system using combinations of segments to build a variety of alternative scenarios.

This Level 1 Evaluation Report documents:

- The Purpose and Need Statement
- The evaluation criteria and evaluation process
- The segments used to configure 12 HSIPR alternative scenarios
- The evaluation findings for the segments and 12 HSIPR alternative scenarios
- The methods used to collect public input on the segments and HSIPR alternative scenarios
- Recommendations for next steps

What is the Purpose and Need for Colorado's HSIPR?

Purpose

A HSIPR system would provide Colorado with a well-supported modal option for the state's transportation network that connects communities and destinations for interregional business and tourism travel; builds on and strengthens Colorado's existing transportation infrastructure; supports the State's Vision, as articulated in the State Rail Plan; and offers statewide social, environmental, and economic benefits that are greater than the capital and operating costs of its implementation.

Need

HSIPR would meet the following needs for travel in Colorado:

- Address the mobility demands of future population growth
- Improve mobility and system capacity by providing a travel option
- Enhance economic growth and development through improved connectivity
- Improve the state's environmental quality and energy efficiency
- Provide economic benefits sufficient to attract new funding sources

Many of these needs address the reality Colorado faces – automobile traffic, freight movements, and general aviation are expected to roughly double between now and 2035. During this same period, the statewide population is projected to increase from 5 to 8 million persons. Given this level of growth and the desire to accommodate new populations in a sustainable manner, CDOT is evaluating travel options other than the single-occupant automobile in order to enhance the capacity of the state's transportation system to move people, goods, and information.

CDOT's adoped Colorado Rail Vision from the State Rail Plan is as follows:

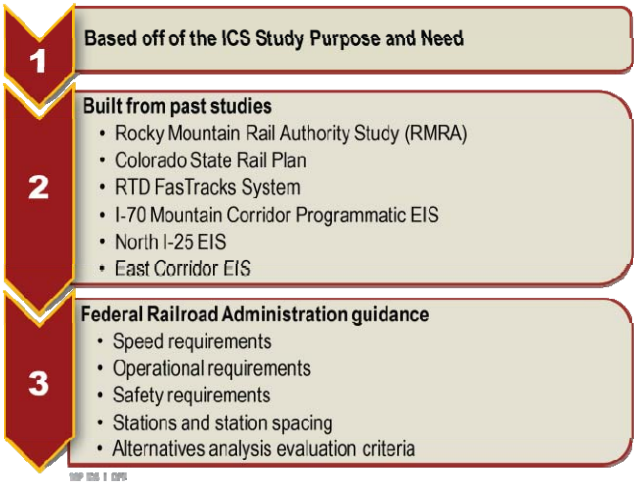
Adopted Colorado Rail Vision

The Colorado rail system will improve the movement of freight and passengers in a safe, efficient, coordinated and reliable manner. In addition, the system will contribute to a balanced transportation network, cooperative land use planning, economic growth, a better environment and energy efficiency. Rail infrastructure and service will expand to provide increased transportation capacity, cost effectiveness, accessibility and intermodal connectivity to meet freight and passenger market demands through investments which include public-private partnerships.

How Were Alternative Scenarios Developed?

The development of alternative scenarios involved building off of past studies, using performance criteria, and considering FRA requirements. **Exhibit ES-3** lists the past studies and FRA guidance that form the basis for the ICS effort.

EXHIBIT ES-3
Information Used to Develop Alternative Scenarios



The technical team took progressive steps to develop the best HSIPR scenarios by:

- **Step 1:** Defining possible segments through the Denver metropolitan area, where a segment is defined as a possible route between two points.
- **Step 2:** Identifying possible segments to the north to Fort Collins and to the south to Colorado Springs and Pueblo.
- **Step 3:** Developing the best-performing HSIPR alternative scenarios using the best segments.

As a result of this analysis, 18 segments were identified and configured into 12 possible HSIPR scenarios. Three groupings of scenarios, A-, B-, and C-series, were considered:

- **A-series:** Those that go directly though the Denver metropolitan area and continue on to Fort Collins or Colorado Springs and Pueblo. Six possible A-series scenarios were identified, as shown in **Exhibit ES-4**.
- **B-series:** Those that circumvent the central Denver metropolitan area and continue on to Fort Collins or Colorado Springs and Pueblo. Four possible B-series scenarios were identified, as shown in **Exhibit ES-5**.
- **C-series:** One scenario involves HSIPR sharing RTD track within the Denver metropolitan area, as shown in **Exhibit ES-5**.

EXHIBIT ES-4
A-Series Alternative Scenarios: Through the Denver Metropolitan Area

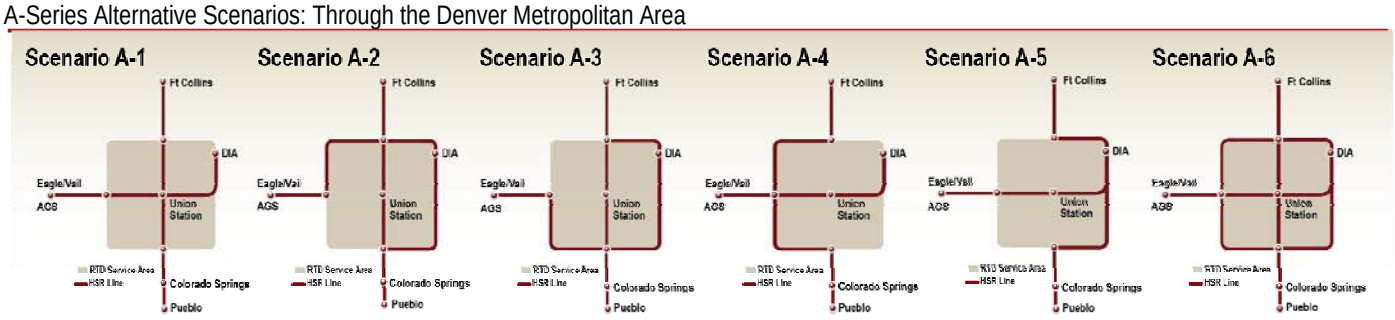
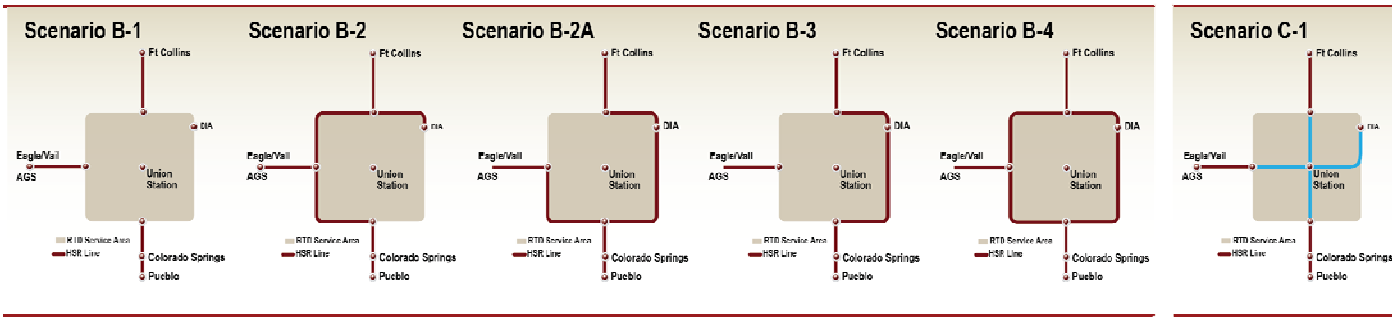


EXHIBIT ES-5
B- and C-Series Alternative Scenarios: Around the Denver Metropolitan Area or Shared Track



HSIPR Alternative Scenarios

A-Series Alternative Scenarios

The A-series scenarios through Denver would provide a faster trip because they are generally shorter than the B-series scenarios that travel around the Denver metropolitan area. However, regardless of the configuration of segments, the direct routing results in other less advantageous trade-offs. Major factors include acquisition of private property for ROW, resulting in greater community impacts, and placement of much of the HSIPR track on aerial structure due to the presence of existing infrastructure such as highway bridges.

These conditions would result in costs that are expected to be about twice that of the B-series scenarios on a dollar-per-mile basis. Routing though the urban area is also expected to require lower operating speeds due to concerns regarding noise and safety. Shifting the east-west segment from one possible segment to another does not markedly change the results. Regardless of the A-series scenario selected, accessing Denver Union Station (DUS) in downtown Denver would be very difficult and costly and would result in significant disruption during construction.

B-Series Alternative Scenarios

The B-series scenarios follow E-470 or C-470 where public ROW is available and development is less urban, resulting in fewer community impacts and lower cost on a dollar-per-mile basis. However, these scenarios are less direct and longer, potentially resulting in longer travel times. The longer distances are expected to be somewhat offset by the fact that the comparatively rural surroundings would allow the trains to operate at higher speeds. Also, none of the B-series scenarios would access DUS directly, requiring riders of the system to transfer from one train to another to get to that destination.

C-Series Alternative Scenarios

The C-1 scenario involves sharing track with the RTD East Rail from DIA to Ward Road in Arvada. Because it would only stop at DIA and DUS through Denver, this scenario would result in a faster travel time than provided by RTD's East Rail project. In the north-south direction, the HSIPR could share track with the future RTD North Metro Commuter Rail Line to DUS. It was found that continuing south would be difficult because the existing light rail technology on the Southwest and Southeast lines is anticipated to be incompatible with HSIPR. Thus, a new segment south of DUS will be identified and assessed in the Level 2 Evaluation.

Track sharing would result in slower travel speeds; however, the advantage of this scenario is that it could save costs of constructing new track through Denver. The track-sharing scenario (C-1) may be combined with the other A- or B-series scenarios.

How Will Alternative Scenarios be Evaluated?

As shown on **Exhibit ES-6**, the approach for the ICS involves three levels of evaluation, each characterized by increasing levels of analysis. The objective of the Level 1 Evaluation was to

EXHIBIT ES-6
Alternative Evaluation Process

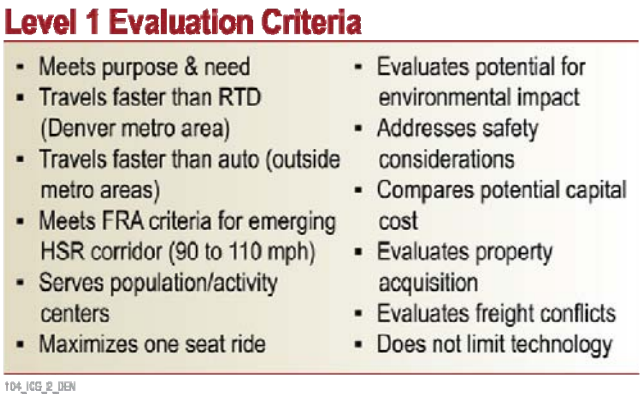
draft a Purpose and Need, define evaluation criteria, identify candidate alternative scenarios and recommend the best for ridership modeling.

For the Level 2 and Level 3 Evaluations the alternative scenarios will be evaluated at increasing levels of detail with quantitative measures of cost, benefits and environmental impacts.

At Level 4, a Preferred Alternative will be presented for public comment. Based on the public comments, the Preferred Alternative will be refined at Level 5. The completion of each level of evaluation culminates as a milestone. The results of each milestone are presented first to an internal Project Management Team (PMT) consisting of CDOT and regulatory agencies, and then to a Project Leadership Team (PLT) consisting of representatives from all local governments within the ICS study area. After incorporating comments received from the PMT and PLT, the recommendations are presented to the public in four open houses – one each in Fort Collins, Denver, Colorado Springs and Pueblo. Public comments will be recorded and incorporated before the subsequent milestone activities begin.

What Criteria Were Used for the Level 1 Evaluation?

The initial evaluation criteria were designed to provide a qualitative review of the Level 1 alternative scenarios:



At Level 1 Evaluation, the majority of the measures were qualitative and based on evaluation of Google Earth-derived segments, conclusions from past studies, and windshield surveys to better understand the physical challenges facing each alternative scenario. Comparisons or trade-offs between alternative scenarios also were evaluated and recommendations were made for presentation to the public.

What are the Level 1 Evaluation Results?

Of the 12 HSIPR alternative scenarios considered, the Level 1 Evaluation recommends five scenarios for ridership modeling. These five alternative scenarios represent the best range of comparisons for future planning; however, the remaining seven alternative scenarios are not precluded from future consideration.

Some questions that the study team will be addressing through the next phase of the study process include:

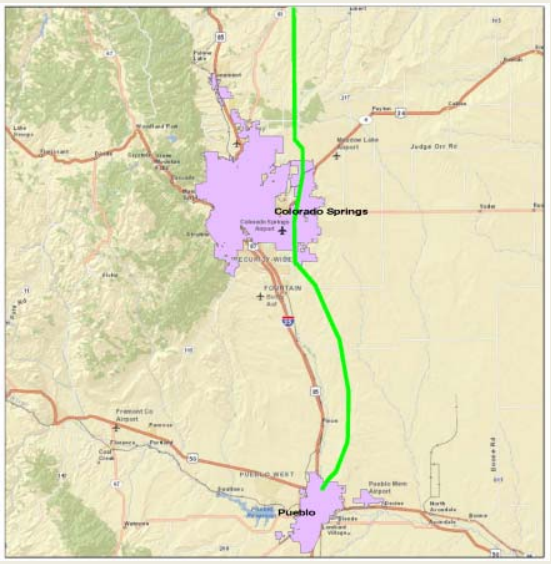
- What is the effect of stopping at DUS versus some other central Denver station location?
- What are the differences in travel time, ridership, and cost-effectiveness between routings that pass through the Denver metropolitan area versus circumventing these areas?
- What is the effect on ridership if HSIPR is constructed as a complete beltway around the Denver metropolitan area versus only a partial beltway or a beltway that traverses only the east or west portions of the Denver metropolitan area?
- What are the impacts of following existing railroad lines north to Fort Collins or south to Colorado Springs compared to straighter, faster segments that do not follow the railroad.

What are the Findings North and South of Denver?

Exhibit ES-7 depicts the candidate HSIPR segments north to Fort Collins and south to Colorado Springs and Pueblo that were assessed during Level 1 Evaluation.

The N-1: Railroad segment, which shares the BNSF ROW, does not technically meet the requirements of HSIPR due to over 100 at-grade crossings, anticipated slow travel speeds and high operational impacts to residential land uses in Longmont, Loveland and Fort Collins. This segment would potentially have poor ridership and thus may not be cost-effective. However, this segment is included as a future commuter rail transit (CRT) alternative in the North I-25 Environmental Impact Statement (EIS), suggesting it has local support at least as configured in the EIS.

EXHIBIT ES-7
Summary of North-South Segment Evaluation

Segment Name and Disposition	
N-1: Railroad Segment	N-2: Greenfield
	
CARRY FORWARD: Incorporate into a HSIPR scenario.	CARRY FORWARD: Incorporate into a HSIPR scenario.
S-1: Railroad Segment	S-2: Greenfield
	
CARRY FORWARD: Incorporate into a HSIPR scenario.	SET ASIDE: Configure a new greenfield segment to replace S-2.

To the extent that this segment can be incorporated into a future HSIPR alternative scenario, perhaps as a minimum operable segment (MOS) it will be retained for possible consideration. However, the best HSIPR segment for fulfilling the Level 1 Evaluation criteria is N-2 which follows I-25. The HSIPR scenarios that will be modeled for ridership will incorporate N-2 as the better option.

Traveling to the south, the S-1: Railroad segment will be retained and S-2: Greenfield segment will be set aside, at least as configured currently. S-2 was poorly received by the public due to impacts to the Black Forest. While a replacement greenfield segment has not been defined at Level 1 Evaluation, the revised segment will be a combination of the S-1 Railroad segment and the I-25 segment. The intent will be to develop a segment that provides the travel speed characteristics of HSIPR and is publically supported. These engineering studies will be part of Level 2 Evaluation.

These analyses outside of the Denver metro area have revealed that many of the agency and public stakeholders desire a system that provides a larger number of stations and operating plan that is more characteristic of commuter rail than is typical of HSIPR. This is an issue that will be addressed in Level 2 Evaluation.

What Alternative Scenarios will be Carried Forward for Ridership Modeling?

As shown in **Exhibit ES-8**, five alternative scenarios will be carried forward for modeling and seven alternative scenarios have been set aside from further consideration. After testing the performance of these five alternative scenarios in the Level 2 Evaluation, it is anticipated that new alternative scenarios will be prepared that improve ridership performance, reduce impacts, and improve cost-effectiveness. This process will continue until the best alternative scenarios are developed for public consideration.

What About Technologies?

At this point in the ICS, no transit technologies have been eliminated. The intent of the Level 1 Evaluation was to find scenarios that allow a full range of technologies and where at least some segments would allow a minimum speed of 90 to 100 mph. Lower speeds would be characteristic of the segments following the railroad alignments, whereas the greenfield segments could be configured for speeds up to and beyond 200 mph. Specific conventional and innovative technologies will be assessed during the Level 2 and Level 3 Evaluations.

EXHIBIT ES-8
Summary of HSIPR Alternative Scenarios

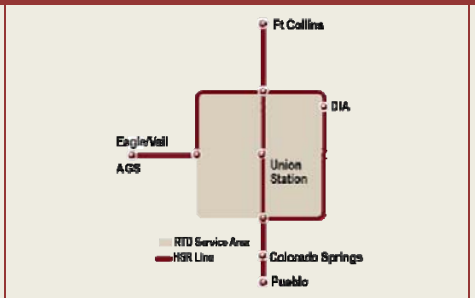
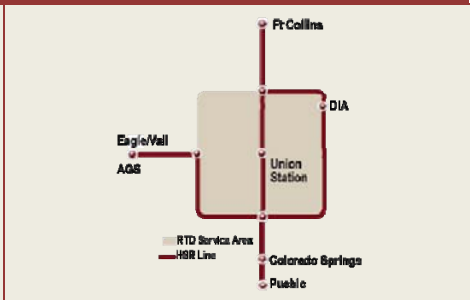
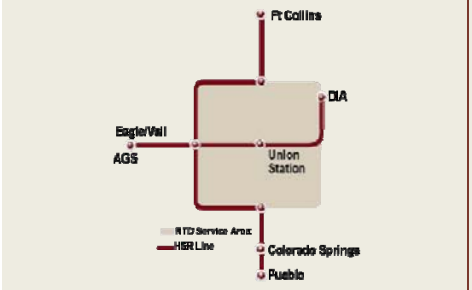
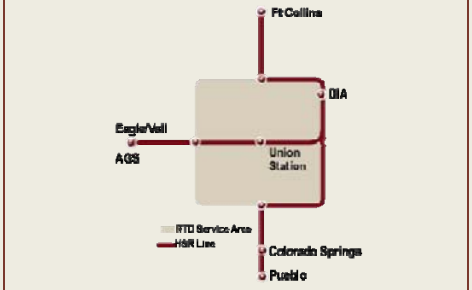
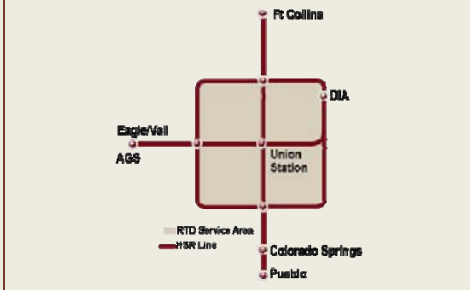
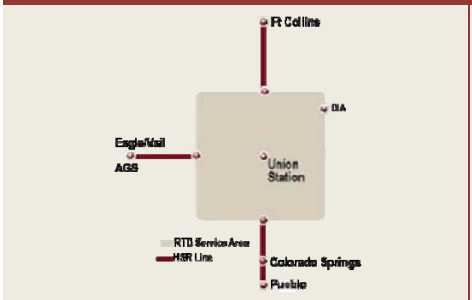
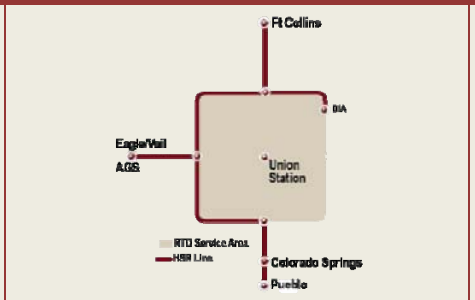
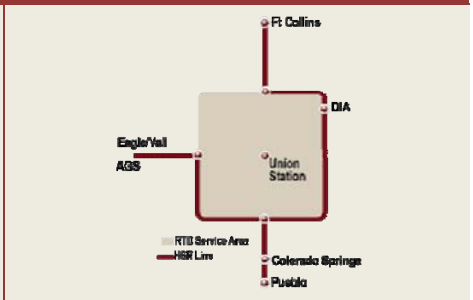
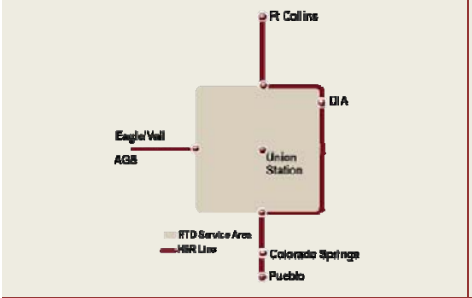
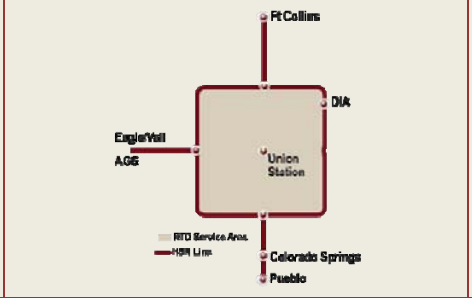
Description and Recommendation: A-Series Scenarios		
		
A-1: Direct Routing through Denver CARRY FORWARD: This scenario will be carried forward to test the ridership of a direct connection through the Denver metropolitan area. The scenario is also highly supported by the I-70 Mountain Corridor stakeholders as it is considered critical to the success of the AGS. Other benefits include: ▪ Shortest and possibly fastest scenario ▪ Provides one-seat ride to the most destinations ▪ Provides contrast to beltway option ▪ Allows consideration of all technologies	**A-2: Beltway Excluding the Southwest Quadrant** SET ASIDE: This scenario is not recommended for modeling because scenarios A-1, A-5, and A-6 are anticipated to provide a better test of ridership.	**A-3: Beltway Excluding the Northwest Quadrant** SET ASIDE: This scenario is not recommended for modeling because scenarios A-1, A-6 and B-2A are anticipated to provide a better test of ridership.
		
A-4: Western Beltway SET ASIDE: This scenario is not recommended for modeling because scenarios A-1 and A-6 are anticipated to provide a better test of ridership.	**A-5: Eastern Beltway** CARRY FORWARD: This scenario is recommended for modeling because it is anticipated to be the lowest-cost option of the A-series scenarios. Other benefits include: ▪ Provides one-seat ride to DIA ▪ Supportive of the AGS ridership ▪ Allows consideration of all technologies	**A-6: Complete Beltway** CARRY FORWARD: This scenario is recommended for modeling because it is anticipated to provide the highest ridership of the alternative scenarios considered at the Level 1 Evaluation. Other benefits include: ▪ Provides one-seat ride to the most destinations ▪ Supportive of the AGS ridership ▪ Potential for highest ridership ▪ Test as a comparison to all others ▪ Demonstrates the case for diminishing returns in ridership versus cost ▪ Allows consideration of all technologies

EXHIBIT ES-8
Summary of HSIPR Alternative Scenarios

Description and Recommendation: B- and C-Series Scenarios		
		
B-1: Denver Periphery SET ASIDE: This scenario will not be modeled because scenario C-1 would be more representative of the project Purpose and Need and would provide continuous HSIPR service through the Denver metropolitan area to other portions of the state.	**B-2: Denver Periphery Including the Southeast Quadrant** SET ASIDE: This scenario is not recommended for modeling because scenarios A-2 and B-2A are anticipated to perform better due to the fact that both provide service to southeast Denver, whereas B-2 does not.	**B-2A: Denver Periphery Excluding the Northwest Quadrant** CARRY FORWARD: This scenario is recommended for modeling because it is important to test a peripheral scenario around the Denver metropolitan area against a direct east-west scenario through Denver such as provided by A-1, A-4, A-5, and A-6. Other benefits include: ▪ Anticipated to be the best performing of the B-series scenarios ▪ Avoids the less well-defined Northwest Quadrant ▪ Allows consideration of all technologies outside of the RTD system
		
B-3: Denver Periphery Eastern Beltway SET ASIDE: This scenario is not recommended for modeling because ridership information on the effectiveness of the eastern beltway scenario will be provided through the modeling of A-5.	**B-4: Denver Periphery Full Beltway** SET ASIDE: This scenario is not recommended for modeling because A-6 will be used to test the ridership effectiveness of a full beltway scenario.	**C-1: Shared Track with RTD** CARRY FORWARD: This scenario is recommended for modeling because it tests the effectiveness of HSIPR sharing existing RTD track. Other benefitsinclude: ▪ Second lowest-cost scenario ▪ Low environmental impact ▪ Provides one-seat ride

How Was The Public Involved?

As discussed above, the completion of each evel of evaluation culminates as a milestone, with the results vetted through the PMT and PLT. Comments from the PMT and PLT are incorporated before recommendations are presented to the public in four open houses – one each in Fort Collins, Denver, Colorado Springs, and Pueblo.

Members of the public and the media were invited to attend the initial series of public open houses held in Summer 2012 to learn more about the ICS and provide input to guide the study team's work.

Multiple CDOT databases from past projects, including the State Rail Plan, RMRA Feasibility Study, and I-70 Mountain Corridor PEIS, were used to notify stakeholders of the open houses. Formal press releases were sent to multiple media outlets 2 weeks prior to the open houses. Media outlets across the Front Range included notices and articles in local newspapers, radio, and television broadcasts as a result of the press releases. Notifications were also sent to major business organizations (Chambers of Commerce) throughout the Front Range to encourage additional stakeholders to attend. Finally, the PLT members were requested to further distribute the open house announcements to their constituents.

Each open house included a series of presentation boards providing a study overview, details of the alternative scenarios, the study process, the initial evaluation results, and the study schedule. Detailed aerial maps of the area were provided to aid discussion with stakeholders and allow stakeholders to write comments directly on the maps. Computer projections of the alternative scenarios were shown in Google Earth format to aid discussion with stakeholders. The open houses were well attended and garnered media coverage by local newspapers, radio, and television news outlets. A total of approximately 240 stakeholders attended the four open houses.

Comments were collected through a variety of methods. A comment area was provided at each open house. A hard copy comment form was available, as well as four laptop computers for people to type comments directly into the comment database. Study team staff was available throughout the open houses for one-on-one conversations with stakeholders. Mail-in and e-mail comments also were accepted following the open houses.

Key comments by geographic area are highlighted below.

What Have We Learned?

Colorado Springs Area – Many attendees were opposed to the greenfield segment as it crosses through the Black Forest area. They expressed a preference for a segment that follows I-25 or parallels the existing rail corridor and provides service to downtown Colorado Springs. Alternately, a segment east of Black Forest also was suggested. Additional noted concerns included noise, forest fires, property impacts, cost, and the appropriateness of high-speed rail versus commuter rail for the Front Range. Attendees suggested several additional criteria including a cost/benefit comparison of implementing HSIPR.

Pueblo Area – Some attendees were in favor of a high-speed rail connection along the Front Range extending to Pueblo and linking to the

Pueblo Union Depot. Of those in favor, one concern expressed was the lack of reliable public transit connections to medical services in Denver for the disabled. Others expressed concern over the lack of sufficient demand and population density between Colorado cities to support high-speed rail. There were noted reservations regarding the financial state of Colorado, the current economic downturn, and the cost to construct and operate HSIPR.

Fort Collins Area — Attendees are well informed of the I-25 North EIS process and the potential transit improvements related to that study. They expressed a mix of support and concern for HSIPR service. Attendees noted support for extending service to Fort Collin's Downtown Transit Center regardless of the segment selected. They expressed interest in utilizing the existing railroad segment between Longmont and Fort Collins and avoiding the I-25 segment as it misses the major population centers. Concerns regarding the cost to construct and maintain a HSIPR system were voiced.

Denver Metropolitan Area — Attendees did not indicate any preference for segments through the Denver metropolitan area over segments on the periphery of Denver as a route to DIA. Several comments were made that serving the urban population centers is critical and that high-speed rail is essential to tourist travel and the local economy. Some attendees noted that DIA may be the key destination, rather than central Denver or DUS.

A comment form was provided at the workshops to focus stakeholder comments on key questions relevant for this stage of the ICS. The form also allowed stakeholders to add their general comments on the study. Questions included on the form, along with a brief summary of responses received for each question, are provided below.

What do you see as the benefits of high-speed rail in Colorado?
Many of the responses indicated benefits such as providing connectivity, connecting four major cities along the Front Range, and providing transportation options other than driving, bringing Colorado into the 21st Century. Some responses noted that there are no benefits of high-speed rail, there is not enough population in Colorado, and the concept is not a wise expenditure of taxpayer money.

Do you have additional evaluation criteria that should be considered? If yes, what are they?
Over 85 percent of the respondents answered "yes" and suggested additional criteria including costs (cost/benefits and cost effectiveness), property impacts, and the ability to provide connectivity within the cities. The study team will incorporate these criteria into the Level 2 and Level 3 Evaluation of alternative scenarios.

Do we have a reasonable range of segments? If not, what additional segments should be considered?
Just over 60 percent of respondents felt that additional segments could be considered. Respondents suggested new segments east of the Colorado Springs area (outside of the Black Forest), along I-25 both north and south of the Denver metropolitan area, along the existing railroad corridors, and to city centers or downtowns.

Do you have any other comments or concerns about this study?
Responses to this question varied widely. Generally, some were supportive while others were skeptical about the ability of CDOT to provide a workable, cost-effective, high-speed rail solution for the Front Range. The formal comment period for the Level 1 Evaluation closed on August 13, 2012.

General comments can still be made at the study's website:
http://www.coloradodot.info/projects/ICS

Study background details and the materials presented at the public open houses are also available on the website.

The comments received from the public stakeholders will be considered and incorporated into the study as appropriate.

What Do We Not Know About Public Opinion

- There appears to be a lack of public understanding of the difference between HSIPR and conventional Commuter Rail Transit (CRT) – Given the high level of concern for more stops, it appears that the public is more interested in a system that performs more like CRT than HSIPR.
- We do not yet understand the level of community support for constructing HSIPR through the urban areas in ICS study area. This understanding will help determine the feasibility of HSIPR through urban areas versus circumventing these areas. The study team received no feedback on the tradeoffs between convenient access to HSIPR versus the construction impact of building a system through the highly developed portions of either the Denver or Colorado Springs metropolitan areas.
- We do not know the level of financial support the public will be willing to provide to obtain the benefits of HSIPR. Members of the public provided comments regarding the State's priorities other than HSIPR, but these comments did not appear to represent the majority opinion.
- Other than comments from the I-70 Mountain Corridor stakeholders, the study team heard no clear preference for the use of conventional versus non-conventional technologies.

What Are The Next Steps?

The completion of Level 2 Evaluation is the next step in the ICS planning process. As shown in **Exhibit ES-9**, this will occur from late summer to early winter 2012. This step involves further development of the alternative scenarios, ridership and revenue estimation, cost estimating and a general assessment of environmental effects. A second series of public open houses is scheduled for the end of 2012. Level 3 Evaluation will start in the first quarter of 2013 and continue until early summer of that year.

Specific Work Elements of the Level 2 Evaluation

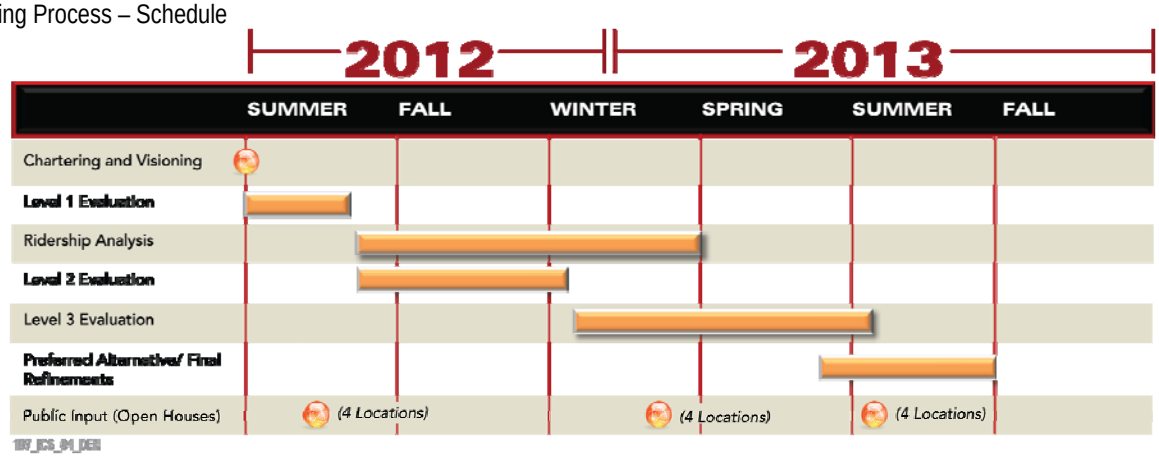
The Level 2 Evaluation involves taking the engineering, planning, and public process evaluations to a higher level of detail than the Level 1 Evaluation, as described below.

Engineering Studies

The Level 2 Evaluation engineering studies will involve preparing concept-level CADD drawings for each of the alternative scenarios to:

- Further assess each segment making up the scenario, in particular the curvilinear constraints, in order to predict the possible top speed of the HSIPR technology.
- Determine the general construction footprint of each segment and alternative scenario.

EXHIBIT ES-9
ICS Planning Process – Schedule



- Begin to assess the quantity of aerial structure or tunnel required compared to at-grade track
- Provide a conceptual estimate of the property acquisition requirements
- Provide parametric cost estimates

Planning Studies

Level 2 Evaluation planning studies will include the following:

- Begin to assess the overall social, economic and environmental benefits associated with implementing HSIPR
- Prepare preliminary operating plan assumptions, including headways (interval between trains), number of trains per hour, dwell times at stations (the amount of time a train is stopped at a station for passenger boarding and alighting), and train capacity requirements
- Develop assumptions on the types of technologies to be considered
- Define general station locations
- Define the general programming requirements for stations to define ROW needs
- Determine the need for maintenance facilities and other support facilities to estimate costs and ROW needs
- Prepare the travel demand model and prepare preliminary ridership estimates
- Calculate preliminary revenue estimates
- Define preliminary funding requirements
- Assess the level of environmental and community impact
- Gain agreement on the approach to Benefit/Cost (BC) analysis
- Prepare preliminary cost/benefit estimates

Public Involvement

Level 2 Evaluation public involvement activities will include the following:

- Conduct special geography-based meetings with the PLT and city stakeholders in Denver, Fort Collins, Colorado Springs, and Pueblo to discuss the specific issues related to the location of HSIPR through or around their communities.
- Continue to update the project website as work is developed.
- Prepare and conduct PLT meetings in November 2012.
- Prepare and conduct public workshops in Denver, Fort Collins, Colorado Springs, and Pueblo in early December 2012.

Additional Alternatives Resulting from the Level 1 Evaluation

As a result of the Level 1 Evaluation, three new segments were recommended through the public process or by further review of the study team. These will be refined in the Level 2 Evaluation. They include:

1. **I-70 ROW /I-76 ROW/96th Avenue/DIA** - Use of the I-76 Right-of-way from I-70 traveling east to 96th Avenue to DIA. A new station would be provided near the intersection of the North Metro Commuter Rail and I-76. DUS would not be accessed in the East/West direction.
2. **New Greenfield Segment from Denver to Colorado Springs and Pueblo** – Due to concerns about impacts to the Black Forest, a new HSIPR Greenfield segment would be defined that generally follows the I-25 South and BNSF rights-of-ways from south Denver to Colorado Springs and Pueblo. This segment will be re-engineered as part of the Level 2 Evaluation.
3. **Revisions to Alternative Scenario C-1: Denver Periphery Shared Track with RTD** –Because it is not possible to share either the Southeast or Southwest LRT track with HSIPR technologies a new segment will be defined during the Level 2 Evaluation from DUS to south of the Denver metropolitan area. Sharing track with RTD's East Commuter Rail to DIA, North Metro Commuter Rail from DUS to the north and the Gold Line Commuter Rail from DUS to Golden is still being considered as part of this scenario.

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Section 1: Introduction

Introduction

This Level 1 Evaluation Report is the first of four reports that will be prepared for the Interregional Connectivity Study (ICS). Sequential reports will be prepared at increasing levels of detail for Level 2 and Level 3 Evaluations. To document the entire planning process and study team recommendations a Final ICS Report will be prepared.

The objective of the Level 1 Evaluation was to draft a Purpose and Need, define evaluation criteria, identify candidate alternative scenarios and recommend the best for ridership modeling.

Study Background

On June 23, 2009, the Federal Railroad Administration (FRA) issued a Notice of Funding Availability for the High-Speed Intercity Passenger Rail (HSIPR) Program in the Federal Register. In response, CDOT, in concert with the Denver Regional Transportation District (RTD), submitted an application to conduct the Colorado Interregional Connectivity Study (ICS). The focus of the ICS as submitted for the grant is to examine high speed technologies, alignments (paths the high speed rail could potentially follow), and financial/funding options for implementing high speed rail along the Front Range. A critical element of the ICS (and a differentiator from past studies) is to understand the potential relationshops of a Colorado high speed rail system to RTD's transit system in the Denver metropolitan area.

The Rocky Mountain Rail Authority (RMRA), a governmental authority made up of more than 50 local governmental entities, completed a *High-Speed Rail (HSIPR) Feasibility Study* in March, 2010 that examined HSIPR on the I-25 Front Range and I-70 Mountain Corridors in Colorado.

The study concluded that HSIPR was feasible within FRA guidelines on an I-25 north-south corridor from Fort Collins to Pueblo (Colorado Front Range Corridor), and on an I-70 (east-west) corridor from DIA to Jefferson County. The most feasible alignment and technology was identified for the purpose of ascertaining the most favorable cost-benefit ratio, but no alignment or technology was selected or recommended.

The RMRA study recommended further study of alternatives, technology and funding strategies a key next step for implementing HSIPR in Colorado. The ICS was initiated to address this recommendation.

Study Objectives

The objectives of the ICS are to:

- Serve as a planning document and provide preliminary recommendations for High-Speed Intercity Passenger Rail alignments, technologies and station locations and connections in the Denver metropolitan area that will maximize ridership for the existing and proposed Regional Transportation District (RTD) FasTracks system and future HSIPR service.
- Identify potential future HSIPR connections with the RTD FasTracks transit program.
- Determine optimal locations for a north-south (Colorado Front Range Corridor) HSIPR alignment from Fort Collins to Pueblo, and an east-west HSIPR alignment from DIA to Jefferson County.

Study Results

The ICS will enable CDOT to:

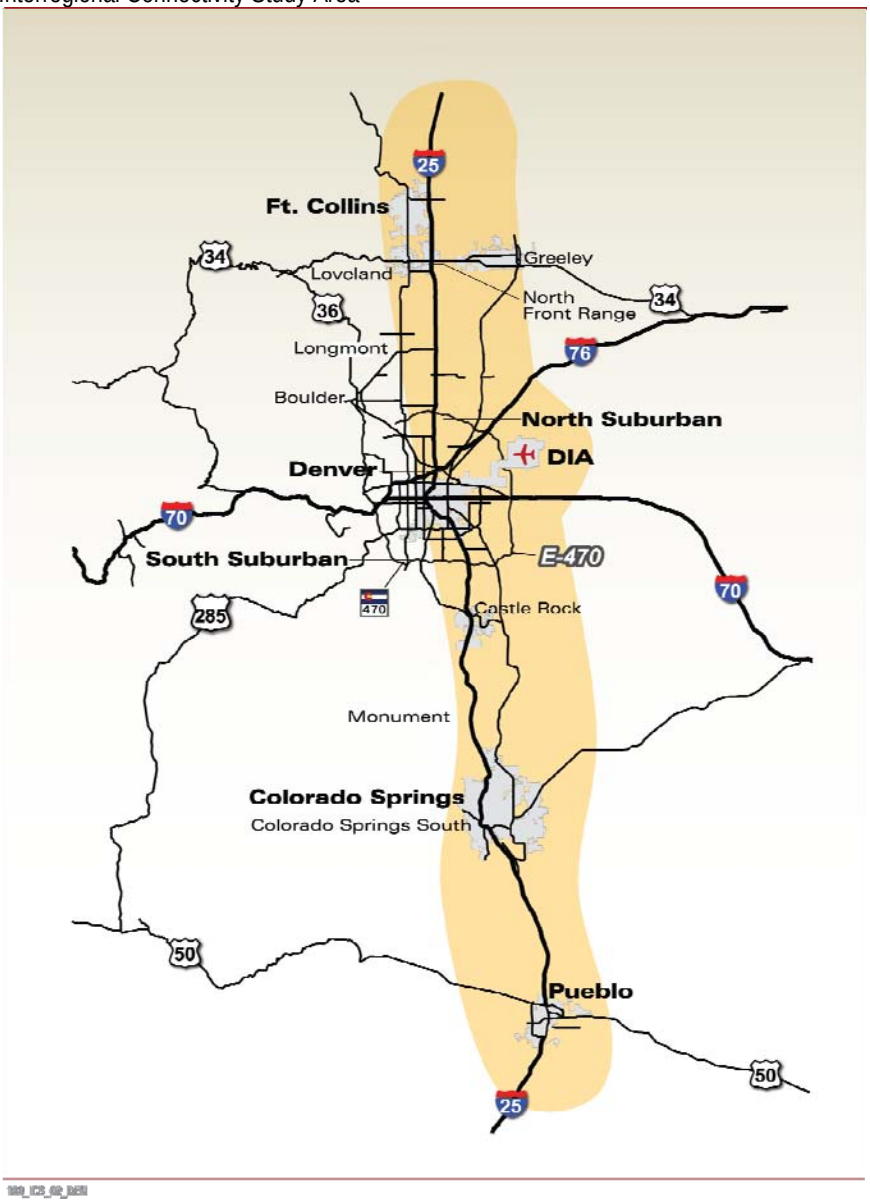
- Evaluate the benefits, technical feasibility, and cost-effectiveness of implementing HSIPR in Colorado.
- Determine how the proposed HSIPR could best connect with existing and proposed RTD transit improvements in metro Denver.
- Build on previous planning efforts to develop recommendations for HSIPR.
- Articulate a vision for high-speed rail in Colorado.
- Engage stakeholders and build support and awareness of high-speed rail.
- Develop an incremental and adaptive implementation plan that provides a practical path forward to advance the state's high-speed rail vision.

Study Area

The study area for the Interregional Connectivity Study is shown on **Exhibit 1-1**. Study area limits include DIA to the east, the City of Fort Collins to the north, the City of Pueblo to the south and the C-470/I-70 Interchange to the west.

CDOT is also conducting an Advanced Guideway System (AGS) Feasibility Study to examine high speed options from Denver to Eagle through the I-70 Mountain Corridor. The two studies are dependent on one another to plan a comprehensive future system.

EXHIBIT 1-1
Interregional Connectivity Study Area

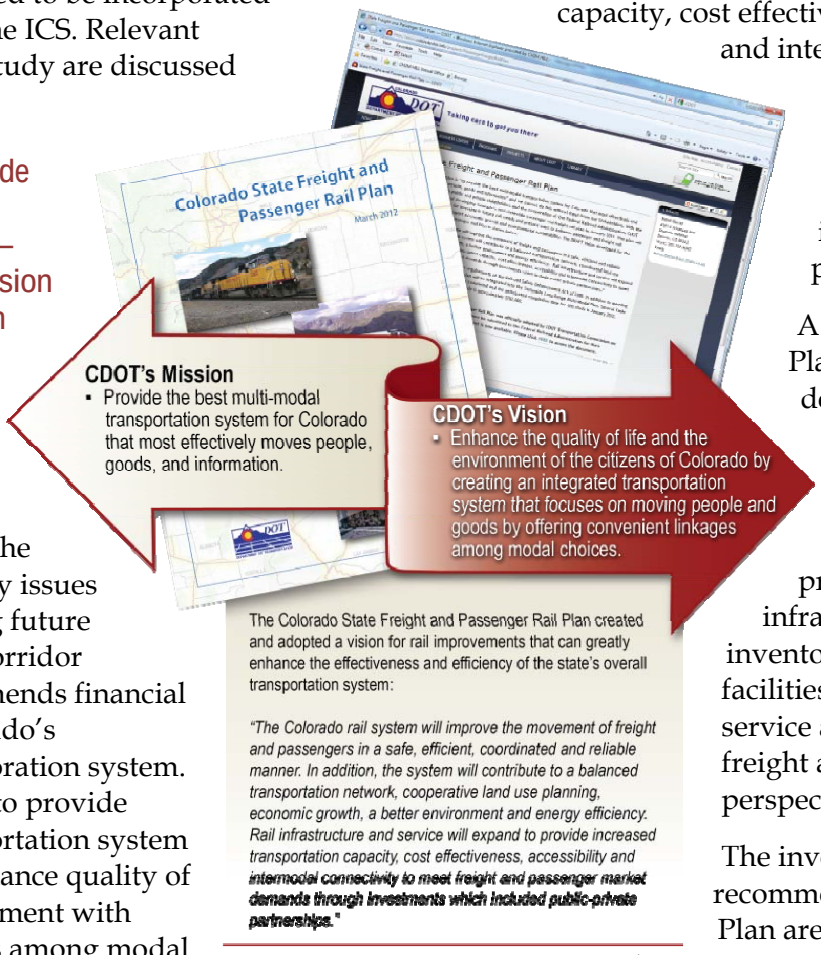


Related Studies Affecting the ICS

Several key previous plans and studies have set the foundation for the ICS. The recommendations made in these studies have been publicly endorsed through the planning process and will need to be incorporated into the results of the ICS. Relevant highlights of each study are discussed below.

CDOT - 2035 Statewide Long Range Transportation Plan – Moving Colorado: Vision for the Future, March 2008

The Colorado Statewide Transportation Plan provides the mission, vision for the future, identifies key issues and trends affecting future planning, defines corridor visions and recommends financial solutions for Colorado's multimodal transporation system. CDOT's mission is to provide multimodal transportation system with a vision to enhance quality of life and the environment with convenient linkages among modal choices. To meet the transportation challenges facing the state, fulfill its mission, and achieve its vision, CDOT must work collaboratively with other agencies and stakeholders to maximize transportation investments and meet travel demand across the state. High-speed Intercity Passenger Rail is an important component of the collective vision for Colorado's multimodal transportation system.



CDOT – State Freight and Passenger Rail Plan (Rail Plan)

With the help of public and private stakeholders and the cooperation of the FRA, CDOT developed Colorado's first statewide passenger and freight rail plan from January 2011 through March 2012.

This plan provides guidance for investing in future rail needs and presents ways to enhance passenger and freight rail development to support economic growth and environmental sustainability. Rail infrastructure and service will expand to provide increased transportation capacity, cost effectiveness, accessibility and intermodal connectivity to meet freight and passenger market demands through investments which include public-private partnerships.

A key aspect to the Rail Plan was the development of an accurate system description and inventory of the existing and proposed rail infrastructure. This inventory includes rail lines, facilities and operating and service attributes, from both freight and passenger perspectives.

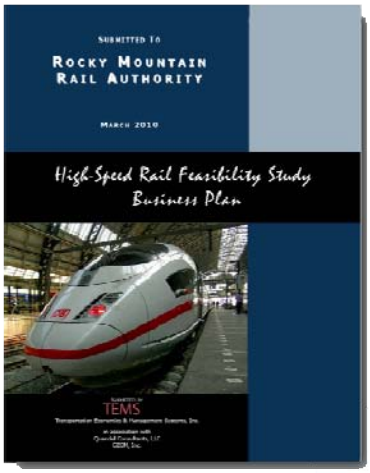
The inventory, analysis and recommendations of the Rail Plan are used in the Interregional Connectivity Study to ensure uniform analysis and consistency in future rail initiatives.

The Rail Plan fulfills the requirements of the Railroad Safety Enhancement Act of 2008. In addition to meeting the Federal requirements, the Rail Plan will be integrated into the Statewide Long Range Transportation Plan.

Rocky Mountain Rail Authority – High-Speed Rail Feasibility Study, March 2010

The ICS study team uses the RMRA's study as a starting point to investigate further and confirm potential technologies and alignments. The RMRA determined that high-speed rail is feasible on the I-70 and I-25 corridors based on FRA criteria. High-speed rail is defined by FRA as a system capable of speeds in excess of 90 mph.

The RMRA study evaluated multiple constrained (using rail and/or highway rights of way) and unconstrained (greenfield) alignments to determine travel speeds and costs. Environmental impacts were not a consideration. The study was conducted beginning in 2007 and concluded in 2010. The study determined that revenue from the I-25 north-south alignment could subsidize the I-70 Mountain Corridor, so that when both are considered as a system the project is feasible.



The RMRA study concluded that multiple configurations would meet FRA criteria for feasibility, but that one option, the FRA-Developed Option, provided the best performance. This option assumed the use of an unconstrained alignment from Fort Collins to Pueblo and a combination of the I-70 constrainged and unconstrained alignment for the I-70 Mountain Corridor. The technology assumed is the very high-speed electric technology similar to the French TGV (*Train à Grande Vitesse*, meaning high-speed train).

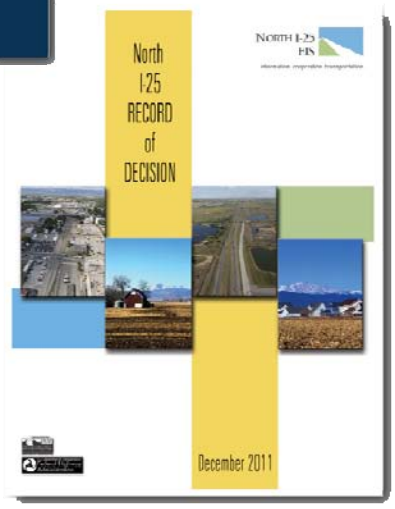
The ICS will assume that one of the finalist alternatives will be similar to the FRA-Developed Option.

The FRA-Developed Option would provide the following:

Speeds	Average: 120 to 200 mph; maximum of 220 mph
Technology	Very high-speed electric train (TGV type)
Cost	$21. 1 B
Operating ratio	1.90
Cost/Benefit	1.49 ($33 B in benefits)
Ridership	$35 million in 2035
Service	15 to 30 minutes throughout the day
Average fare	$0.35/mile

CDOT – North I-25 Environmental Impact Statement (EIS) and Record of Decision (ROD), December 2011

The North I-25 EIS studied transportation improvements from Denver to Fort Collins, Colorado on a north-south axis and from Greeley to Longmont, Colorado on the east-west axis. The Preferred Alternative includes general purpose highway widening of I-25, the addition of Tolled Express Lanes, Express Bus service and commuter rail. The commuter rail alignment would follow the Burlington Northern Santa Fe (BNSF) alignment to Fort Collins, through Loveland and on to Longmont, eventually terminating at RTD's North Metro rail line. The system would largely be single track and serve nine stations. Because this alternative has a Record of Decision (ROD), it is assumed that it will represent the constrained alignment from Denver to Fort Collins. The North I-25 EIS was conducted beginning in 2003 and concluded in 2011.



CDOT – Advanced Guideway System (AGS) Feasibility Study, Currently Underway

The CDOT Division of Transit and Rail is also in the early stages of the AGS Feasibility Study that runs concurrently and interfaces directly with the Interregional Connectivity Study. The concurrent AGS Feasibility Study addresses the feasibility of high-speed transit technologies in the I-70 Mountain Corridor by soliciting responses from industry. These proposals will define technologies, costs and the feasibility of implementing AGS in the I-70 Mountain Corridor. The ridership studies developed for the ICS will be used to determine the feasibilitly of AGS. Recommendations from the vendor proposal for the AGS Feasibility Study will be included for use in the ICS.

CDOT – I-70 Mountain Co-Development Program, Currently Underway

CDOT is currently tendering proposals for the I-70 Co-Development Program that will incorporate a Public-Private Partnership to implement the transportation improvements specified in the ROD for the I-70 Mountain Corridor.

Recommendations from the ICS and AGS studies will influence the approach taken in the Co-Development Program. It is anticipated that the ICS ridership analysis will be used and incorporated into the Co-Development strategy.

Exhibit 1-2 shows the inter-relationship among these three projects.

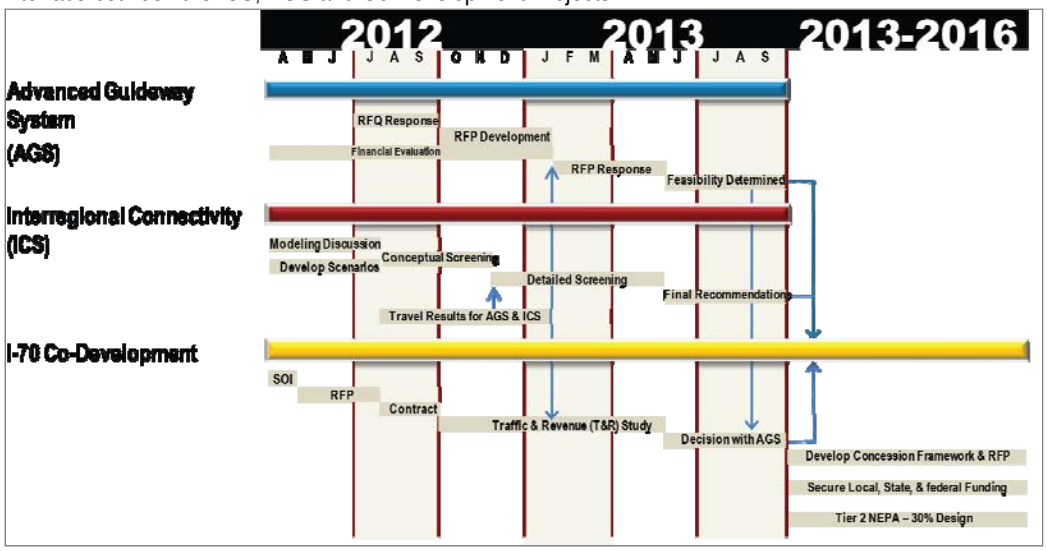
Regional Transportation Plans in the ICS Study Area

It is important to understand how the Metropolitan Planning Organizations (MPOs) within the study area have addressed commuter and intercity passenger rail in their respective long-range Regional Transportation Plans (RTPs). Reviewing these RTPs allows the study team to gauge the level of public support for major transit improvements and understand how the MPOs envision the future of transportation in their respective areas. The four urbanized areas within the ICS study area (Fort Collins, Denver, Colorado Springs, and Pueblo) address commuter rail and intercity passenger rail in their RTPs. None of the RTPs identify a specific route or station location between Denver and Pueblo. The North Front Range MPO supports the selection of the Preferred Alternative in the North I-25 Corridor EIS, where the BNSF right-of-way will be used for commuter rail service.

Pikes Peak Area Council of Governments (PPACG)

The Pikes Peak region includes the urbanized areas of El Paso County, Park County, Teller

EXHIBIT 1-2
Interface between the ICS, AGS and Co-Development Projects



County, and the municipalities of Alma, Calhan, Colorado Springs, Cripple Creek, Fairplay, Fountain, Green Mountain Falls, Manitou Springs, Monument, Palmer Lake, Ramah, Victor, and Woodland Park. The PPACG completed the *Moving Forward Update* 2035 Regional Transportation Plan update in January 2012. The long-range transportation plan addresses regional transportation deficiencies and identifies projects that will improve the transportation system for the region. The RTP indicates that the I-25 corridor carries the highest volume of traffic of any road in the area and is a critical roadway for linking commerce along the Front Range and the nation. In order to manage congestion, a project was proposed to construct a fixed-guideway system to connect the Front Range populations to Denver and the I-70 corridor.

The RTP states that light rail, commuter rail, bus rapid transit, or streetcars are all options to consider. The RTP identifies stations located in Monument, downtown Colorado Springs, and Fountain. The RTP also describes the Rocky Mountain Rail Authority (RMRA) Feasibility Study's proposal to construct a passenger rail line paralleling I-25 throughout the state. A specific route or stations within the Pikes Peak urbanized area are not endorsed, but the RTP acknowledges that studies are being conducted to implement intercity passenger rail in the region.

The RMRA selected one option that best met or exceeded FRA feasibility criteria to further refine, analyze and use as a test-case scenario for developing an implementation plan. The option uses a very high-speed electric train on a greenfield alignment that serves Monument east of the downtown, Colorado Springs (Woodmen Rd.), Colorado Springs Airport, and Pueblo.

The RTP addresses the CDOT Rail Relocation Implementation Study, which concluded that a plan for diverting the majority of heavy freight traffic from the Joint Line (the existing rail route from Denver through Colorado Springs to Pueblo) to east of the Front Range, allowing the line to be used for intercity passenger rail service, should be studied further.

Denver Regional Council of Governments (DRCOG)

The Denver urbanized area includes Adams, Arapahoe, Boulder, Broomfield, Denver, Clear Creek, Douglas, Jefferson, and Gilpin Counties and numerous municipalities within those counties.

The DRCOG adopted the *2035 Metro Vision Regional Transportation Plan Update* on February 16, 2011. The Regional Transportation Plan (RTP) states that by 2035, an additional 1.4 million residents and more than a million jobs will place great demands on the existing transportation system.

The RTP addresses the challenges and guides the development of a multimodal transportation system to accommodate this growth. DRCOG's RTP identifies a need for routes to be added to the metro rapid transit system. The base metro rapid transit system will consist of light rail, commuter rail, and bus/Bus Rapid Transit/High-Occupancy Vehicles/High-Occupancy Tolling facilities.

The RTP envisions that the state intercity corridors will extend from the base system to provide connections to destinations throughout the state. The corridors will be developed with a commuter rail or bus system and will also incorporate elements of a statewide intercity rail system. The RTP does not endorse a specific route that the intercity rail system would use. The RTP does not address the Rocky Mountain Rail Authority Feasibility Study or any other intercity passenger rail studies in the area.

Pueblo Area Council of Governments (PACOG)

The PACOG urbanized area includes the City and County of Pueblo, Board of Water Works, School District No. 60, School District No. 70, Pueblo West Metropolitan District, Colorado City Metropolitan District, and Salt Creek Sanitation District.

PACOG adopted the *2035 Long Range Transportation Plan* (LRTP) *Amendment* on April 28, 2011. The LRTP is a plan for the development of transportation programs and projects within the Pueblo area. Within the LRTP, the existing conditions of each transportation mode and the needs for each mode are identified. On the topic of passenger rail, the LRTP discusses the RMRA Feasibility Study to provide passenger rail services in the I-25 and I-70 corridors. The Plan does not endorse a specific route that the intercity rail system would use, but does present a figure depicting possible routes for an intercity passenger rail line that uses the greenfield alignment, not the existing rail corridor, between Denver and Pueblo that was presented in the RMRA Final Report. The figure shows a station stop in downtown Pueblo.

North Front Range Metropolitan Planning Organization (NFRMPO)

The NFRMPO urbanized area includes Weld and Larimer Counties and the Cities of Berthoud, Eaton, Evans, Fort Collins, Garden City, Greeley, Johnstown, La Salle, Loveland, Milliken, Severance, Timnath, and Windsor.

In September 2011, the NFRMPO completed and adopted the *2035 Regional Transportation Plan* (RTP) *Update*. The RTP supports the outcome of the North I-25 Environmental Impact Statement (EIS) and plans to work with CDOT to implement the Preferred Alternative. The Preferred Alternative includes commuter rail along the BNSF rail corridor, express bus along I-25, and commuter bus along US 85.

Additionally, I-25 will be widened to accommodate two new lanes between SH 14 and US 36. By 2035, the RTP anticipates that the North I-25 EIS Phase 1 improvements will be completed. Preservation of right-of-way for commuter rail is included in Phase 1.

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Section 2: Purpose and Need Statement

Introduction

This Purpose and Need Statement was written to provide the basis for developing, and subsequently evaluating, interregional transit solutions that will be examined in this ICS. The statement is made up of three components:

- Purpose,
- Needs, and
- Goals, Critical Success Factors, Risks and Mitigations

The Purpose specifies what CDOT is striving to accomplish with a HSIPR system in Colorado. The Needs have been identified in previous plans and studies conducted at the local, regional and state level to connect communities along the front range and on the I-70 Mountain Corridor with rail transit. As described in Section 1: Introduction, these plans and studies set the foundation for ICS. Goals, critical success factors, risks and mitigations specific to this study were developed by the CDOT study team and endorsed by the PMT and PLT before being vetted through the public at open houses. Each of these components of the Purpose and Need Statement are discussed below.

Fulfillment of the Purpose and Need statement becomes an important evaluation criterion in all levels of evaluation from this point forward.

Purpose

A HSIPR system will provide Colorado with a well supported modal option for the State's transportation network that connects communities and destinations for interregional business and tourism travel; builds on and strengthens Colorado's existing transportation infrastructure; supports the state's vision, as articulated in the "State Rail Plan"; and offers statewide social, environmental, and economic benefits that are greater than the capital and operating costs of its implementation.

Adopted Colorado Rail Vision

The Colorado rail system will improve the movement of freight and passengers in a safe, efficient, coordinated and reliable manner.

In addition, the system will contribute to a balanced transportation network, cooperative land use planning, economic growth, a better environment and energy efficiency. Rail infrastructure and service will expand to provide increased transportation capacity, cost effectiveness, accessibility and intermodal connectivity to meet freight and passenger market demands through investments which include public-private partnerships.

Needs

High-speed intercity passenger rail will meet the following needs.

1. **Address the mobility demands of future population growth.**
2. **Improve mobility and system capacity through provision of a travel option.**
3. **Enhance economic growth and development through improved connectivity.**
4. **Improve the State's environmental quality and energy efficiency.**
5. **Provide economic benefits sufficient to attract new funding sources.**

1 Address the mobility demands of future population growth.

Capacity requirements continue to increase —The Colorado Department of Local Affairs, the state's official demographer, projects Colorado's population will grow from 5 million to nearly 8 million by 2040.

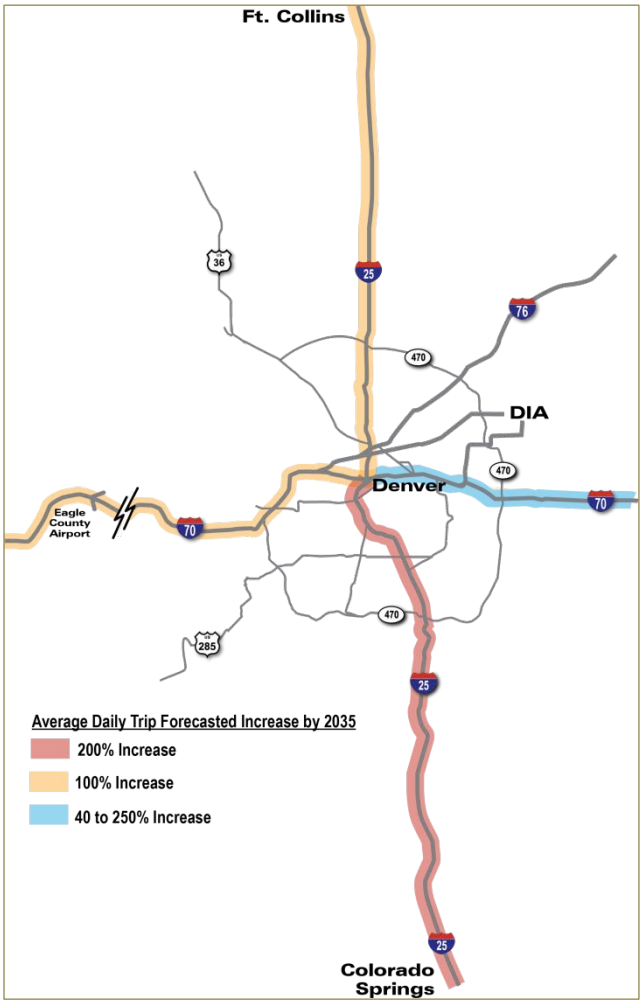
Population growth is projected to remain concentrated in the Front Range where 80 percent of the state's population currently lives. Northern Front Range counties (Adams and Weld) are growing twice as fast as other areas and higher growth rates are also projected in southern Denver metro area (Douglas County) and Colorado Springs. Population and employment growth correlate to more travel demand and increased trips, particularly through the Front Range.

As a demonstration of the effects of future population growth, the need to provide additional trip capacity in the I-25/Front Range and I-70/ East and Mountain Corridors is clear. For example, the number of daily trips (ADT) for the I-25 corridor between Denver and Fort Collins is forecasted to increase over 100 percent in the busiest sections between now and 2035; the respective percentage in ADT growth for the I-70 East corridor ranges from 40 to 250 percent depending on the location.

In the I-25 corridor between Denver and Colorado Springs, the number of daily trips is also anticipated to double between now and 2035. In addition, ADT is also anticipated to increase by about 100 percent between now and 2035 between Denver and Eagle County. (See **Exhibit 2-1**).

CDOT has programmed additional highway capacity in those corridors, but that construction is not anticipated to meet total trip demand. An interregional high-speed rail network can help absorb some of that additional trip demand and can provide travel alternatives in those corridors.

EXHIBIT 2-1
Projected Increase in ADT by Year 2035



Unmet travel demand — Colorado's transportation system is vital to supporting population and economic growth in the state. There is particular need to provide additional trip capacity in the I-25 and I-70 corridors, which are the backbone of the state's transportation network.

Interstates carry 40 percent of all trips in the state, despite being only 10 percent of the total lane miles. Interregional trips are particularly underserved. The metropolitan planning organizations estimate that less than half of needed transit trips (359 million in 2035) can be met by the current system. Many of these unmet trips are for interregional travel. Unmet demand is also significant in the I-70 Mountain Corridor. Travel demand studies conducted for the I-70 Mountain Corridor PEIS estimated that unmet

demand accounts for up to 70,000 suppressed trips per day and that additional highway capacity alone cannot serve this demand.

HSIPR☑

An interregional high-speed rail network can help absorb additional trip demand and provide travel alternatives in those corridors, which is why both the I-70 Mountain Corridor and I-25 North Records of Decision include interregional rail as central components of the improvements.

Long and unreliable travel times—Currently, travel times between and among all major destinations in the I-25 and I-70 corridors are unstable and unpredictable, primarily due to population growth and related trip demands and congestion.

Average delay per trip on congested highways is currently 22 minutes; by 2035 this delay is expected to increase to 70 minutes. Predicted over-capacity highway infrastructure is shown on **Exhibit 2-2. T**rip times are widely variable at different times of the day and the year and are significantly affected by minor incidents and weather factors. There is a need to provide shorter travel times – and better travel time reliability - throughout the corridors to allow Colorado to maintain its attractiveness and quality of life and its economic growth. I-25 and I-70 are the primary corridors serving longer distance trips in Colorado. High travel volumes during peak periods on these corridors result in travel times two to three times free flow conditions. For instance:

- By year 2035, about 85 percent of I-25 in Denver and north to Fort Collins is projected to be congested and to operate over capacity during the peak periods of travel. Peak AM hour southbound travel times are expected to double by 2035, and peak hour speeds will average only 30 mph.
- I-70 through Denver is already near or over capacity. CDOT projects that by 2030, I-70 in the Denver metro area will be congested 20 to 40 percent of the day.
- By year 2035, I-70 west of Denver will operate over capacity all day on Saturdays, Sundays, and holidays and some weekday periods. Severe congestion (speeds averaging less than 20 mph) is predicted to occur more than 10 hours per day on Sundays in 2035. Long travel times deter travel and negatively affect mountain community economies as would-be visitors choose not to travel based on poor travel conditions.

Congested conditions make travel unpredictable even in off-peak periods. High traffic volumes also tax the highway infrastructure, which is aging and largely considered functionally obsolete, contributing to congestion and poor reliability. These congested areas of I-25 and I-70 have higher than expected crash rates, presenting safety and reliability concerns, which are exacerbated during winter weather conditions.

In addition to supporting person trips, there is a need to improve the travel time and reliability, and to reduce associated costs of goods movement in Colorado to allow the state to maintain its strong economic position and to help maintain jobs and other economic benefits provided by goods movement.

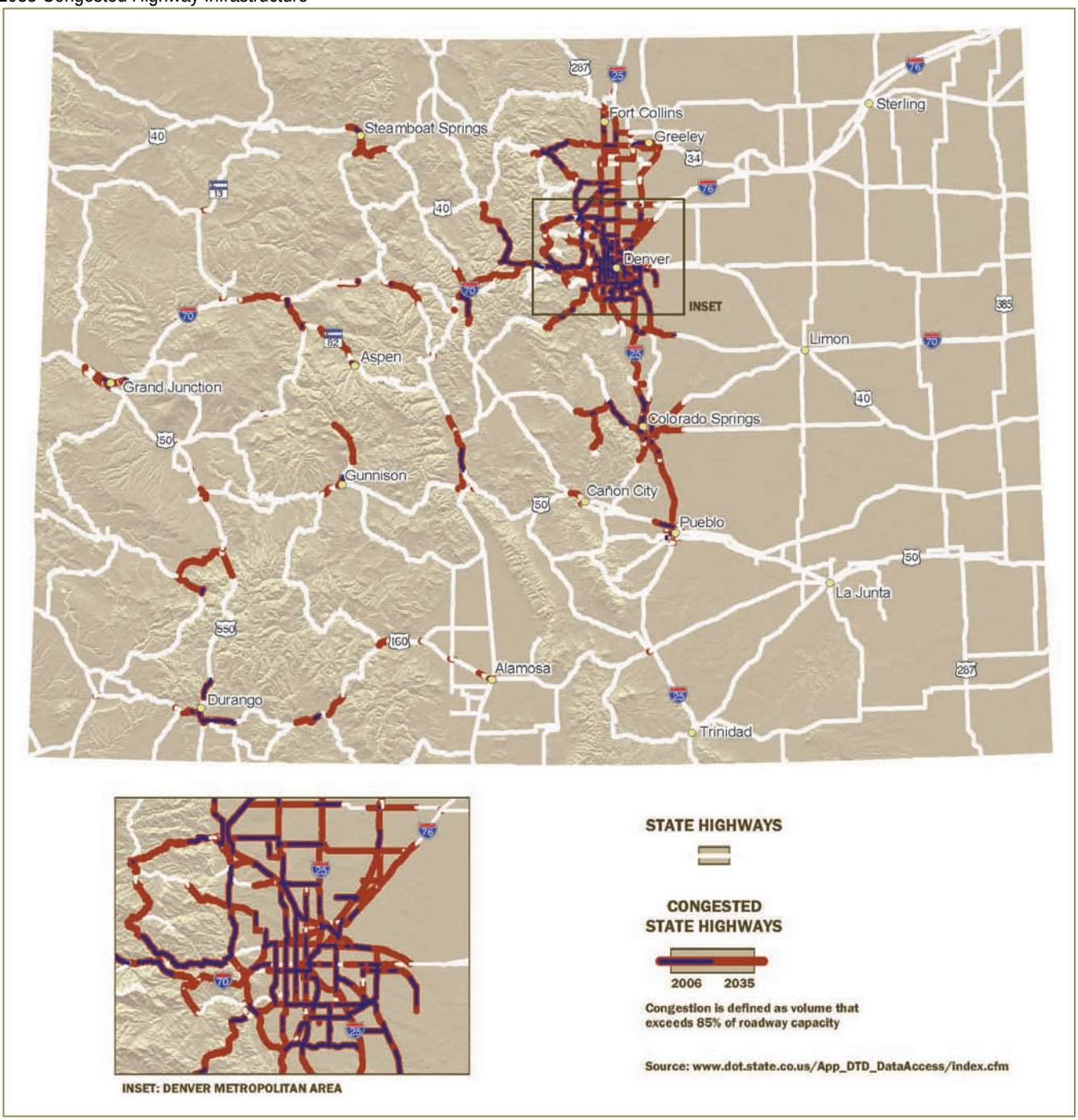
HSIPR☑

A HSIPR system can help meet that need in a number of ways: by freeing up trip capacity on major roadway corridors; by using the high-speed network to provide some cargo movement between and among major activity centers; and by providing associated economic growth and development that attracts goods providers and shippers to the state.

HSIPR☑

A HSIPR system can help provide faster travel times between all major destinations, allowing users to bypass congestion and rely on a stable transportation network and schedule. A reliable alternative travel mode will also help reduce volumes and pressures on the existing system, increasing capacity and safety on the interstate system.

EXHIBIT 2-2
2035 Congested Highway Infrastructure



Improve mobility and system capacity through provision of a travel option.

Support Colorado's multimodal, integrated transportation system—CDOT's Division of Transit and Rail is responsible for planning, developing, and integrating rail in the state-wide transportation system. Expanding transit is a key state-wide goal for mobility challenged corridors like I-25 and I-70, in large part because it frees up capacity for highway and freight rail movement. Additionally, transit and rail are highly valued by Colorado's citizens as evidenced by numerous state-wide and regional transportation studies that have found public support for increased rail service highest of all transportation options.

A recent American Public Transportation Association supported study found that cities with large, well-established rail systems have significantly higher per capita transit ridership, lower average per capita vehicle ownership and annual mileage, less traffic congestion, lower traffic death rates, lower consumer expenditures on transportation, and higher transit service cost recovery than otherwise comparable cities with less or no rail transit service. The study concludes that rail provides a backbone for transit that cannot be met by bus-only or limited rail systems. The RTD's FasTracks program is making a significant investment in providing this type of a comprehensive rail system in the Denver metro area.

Enhance intercity travel options —Alternative modes of travel are very limited outside the core Denver metro area. Rural areas and population centers are poorly connected, and interregional transit service (e.g., Fort Collins to Denver) is limited or non-existent.

There is a need to expand and enhance the non-auto modes of travel in communities throughout Colorado, especially in activity and population centers in the Denver metro area, the Front Range, and the I-70 Mountain Corridor. Currently, many communities do provide local transit service in addition to promoting alternative modes such as bicycling.

Integrate HSIPR and existing passenger rail transit — Interregional rail would provide an opportunity to expand the state's rail network and provide additional trip connections to other parts of the state. The Denver RTD FasTracks program has initiated a $7 billion vision of 120 miles of new fixed guideway transit.

HSIPR☑

A HSIPR will allow convenient and cost-effective connections between the FasTracks system, airports, and other transportation corridors in the state, further enhancing use of alternative modes and capitalizing on existing infrastructure investments, while providing key linkages between the Denver metro area and major activity centers throughout the state.

HSIPR☑

Implementation of HSIPR with its new stations and related transit-oriented development, can also encourage development or enhancement of additional alternative mode systems in communities throughout Colorado through grants or value capture that would otherwise not be available to those communities. Empirically, rail attracts more riders than other transit modes and is thus effective in creating a meaningful mode shift from highway travel.

Enhance economic growth and development through improved connectivity.

Create jobs and stimulate the economy —There is a need to provide transportation options that enhance the state's economy; serve key employment, business, residential, and recreation centers; and attract economic development by competing with other states already investing in rail infrastructure.

HSIPR☑

A HSIPR network would support communities and enhance economic growth throughout

Colorado by providing convenient and affordable access for people of all income levels and in varied geographical areas to other employment centers, business centers, and residential centers throughout the state.

HSIPR☑

A HSIPR network could also provide a new transportation mode that allows more efficient use of existing infrastructure wherever possible and improves connections between rural areas and major population centers.

Generate direct economic benefits— A HSIPR system would provide direct economic benefits to the state through job creation and access, convenient connection, and attracting business and employees. The public and private investments in a HSIPR would have benefits throughout Colorado providing employment and supporting ongoing economic growth.

HSIPR☑

A HSIPR would provide a significant number of employment opportunities, both short-term during its construction, and long-term, during its ongoing operations. It also would provide convenient connections between employment and residential centers, providing better access to jobs throughout Colorado and would help the state attract businesses and employees seeking a higher quality of life that is associated with integrated transportation systems, particularly rail options. The RMRA study found that HSIPR in Colorado would generate $33 billion in benefits against a capital cost of $21.1 billion. Further, the study predicted an operating ratio (revenues divided by operating costs) of 1.49.

Support aviation—There is a need to improve connectivity, travel times, and travel time reliability between the state's major activity centers and its airports.

Aviation travel in the state is projected to double by 2035. Colorado's public airports generate $23.5 billion in annual economic activity and are responsible for 280,000 jobs. Consequently, maintaining Colorado's economic strengths associated with its airport network is critical– not only DIA, but the strong system of regional airports at major activity centers throughout the state.

HSIPR☑

An HSIPR would provide significant benefits to the state's airport system in a number of ways by providing additional trip options at DIA for those accessing the state; reducing congestion at feeder and regional airports (thereby freeing up capacity at those airports); and providing reliable and cost-effective accessibility options to resort areas in times of inclement weather.

Support tourism —Under unconstrained conditions, tourism is also expected to double by 2035.

Tourism is the second largest industry in Colorado, generating $750 million in local and state tax revenue in 2010. Colorado has made an investment in tourism advertising, and this investment, along with the economic recovery, has increased tourism trips to Colorado, with 2010 being a record-setting year with 29 million overnight trips to the state (an increase of 6.1 percent over 2009) and spending of $8.8 billion. Similar numbers were recorded in 2011, with Colorado continuing to record increased visitors in all segments despite a flat or declining national market.

More than 80 percent of overnight visitor spending occurs in the Front Range and mountain resort communities. Colorado continues to lead all states in the competitive overnight ski travel market – garnering approximately 19 percent of all trips in 2011.

Improve freight movements—Continued congestion on the state's highway infrastructure will reduce the cost-effectiveness of overall freight movement. Further, freight volumes will need to increase to serve future growth and move goods to other growth areas in the U.S.

The American Trucking Association reports that 2011 was a record year for growth of trucking tonnage nationwide, indicative of the improving

economy. While 2012 is likely to be a more normal growth year (around 3 percent), interstate trucking remains a significant demand on the state's transportation infrastructure.

HSIPR☑

By reducing growth pressures on the state's highway network, the provision of HSIPR will contribute to higher efficiencies for the movement of freight.

Improve the State's environmental quality and energy efficiency.

Providing an alternative to highway travel has a number of environmental and social benefits, including:

- ***Promote land use planning and livable communities***
- ***Provide environmental benefits to Colorado***
- ***Promote Energy Efficiency***

Promote land use planning and livable communities — There is a need to support the land use goals of the state and local governments throughout the Front Range and I-70 Mountain Corridors related to limiting sprawl and focusing development around transit investments. The RTD FasTracks program is already working in that direction in the Denver metro area.

HSIPR☑

A HSIPR system can expand that philosophy throughout the state by providing the opportunity for jurisdictions along the high-speed rail corridors to focus new development near stations and to move toward sustainable transit-oriented development around transit nodes.

Provide environmental benefits to Colorado — There is a need to support state goals of providing additional means and incentives to the residents of Colorado to reduce their per-capita vehicle miles travelled (VMT) and related greenhouse gas (GHG) emissions.

HSIPR☑

A HSIPR system can help reduce reliance on the single-occupant auto for many trips throughout Colorado, helping reduce per capita VMT, GHG emissions, and meet air quality conformity goals. The reduction in petroleum products would reduce dependence on foreign oil.

HSIPR☑

Integrating HSIPR into the state's transportation system would divert highway travel, provide additional capacity and travel choices, and help focus development in a more sustainable manner.

Promote energy efficiency —There is a need to support state goals of reducing per-capita energy consumption, related both to energy conservation itself (preserving future energy resources) and the environmental and fiscal cost of energy production and consumption.

HSIPR☑

A HSIPR network can help reduce per-capita energy consumption by providing an alternative to the single-occupant auto for many trips throughout Colorado.

Provide economic benefits sufficient to attract new funding sources.

According to the 2035 Statewide Transportation Plan, anticipated revenues at $123 billion represent only about fifty percent of the cost, anticipated at $249 billion of the multimodal vision for the state. Of the total, 24 percent has been dedicated to transit. While this is a large policy commitment, there is little funding available to fulfill the transit vision.

The ability to generate local funding will be critical to obtaining Federal grants. To be sustainable, the HSIPR program will need a strong source of state and local funding commitments. To obtain the political support for new sources of revenue, the recommended program must clearly demonstrate economic and other societal benefits.

HSIPR☑

As stated above, the RMRA predicts highly positive benefit/cost ratios resulting from the implementation of HSIPR in the state. Benefits at these levels should be sufficient to gain public support for revenue increases; they will also be sufficient to attract private funding to the program.

The inclusion of private funding in the program will further increase support for a project at the Federal level. Thus the preferred alternative will need to realize benefit/cost ratios comparable to the RMRA study.

Goals, Critical Success Factors, Risks and Mitigations

Goals, critical success factors, risks and risk mitigations were developed during the joint ICS/AGS chartering workshop, endorsed by the PMT and PLT and vetted through the public open houses. These goals, success factors, risks and mitigations are shown in **Exhibit 2-3**.

EXHIBIT 2-3
Goals, Critical Success Factors, Risks and Mitigations

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. ▪ Project clearly demonstrates congestion, population growth, and economic development considerations.	▪ Political support is not developed and ballot measures are not adopted. ▪ 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. ▪ Delays in implementation of FasTracks program.	▪ Incorporate to the maximum extent the results from previous publicly-endorsed transportation studies – State Rail Plan, I-25 North EIS, I-70 Mountain Corridor PEIS, Regional Transportation Plans, etc. ▪ Provide combined PMTs and PLTs for the ICS and AGS studies. ▪ Endorsement by the agency and public stakeholders at each project milestone. ▪ Implementation of each of the mitigations defined below. ▪ Present key demographic, economic and transportation challenges anticipated in future. ▪ Develop/implement an effective media outreach strategy. ▪ Vision is strong enough in the public's mind to justify sequential segments/phases and overcome public misperceptions about comparative advantages of mobility modes in the future in view of demographic, economic and environmental trends.

EXHIBIT 2-3
Goals, Critical Success Factors, Risks and Mitigations

Goal	Critical Success Factors	Risks	Mitigations
Develop a Plan that Maximizes Ridership for HSIPR and RTD's FasTracks System	▪ Maximize connectivity between the systems and modes such as transit systems, motorists, pedestrians/bicyclists. ▪ Timely implementation of FasTracks program. ▪ Maximize direct links to existing population centers/ development hubs.	▪ Development of competing systems for funding (federal grants, programs, etc.) with RTD/FasTracks. ▪ Too much focus on local wants without consideration of the system as a whole. ▪ Different technologies/ integration.	▪ Use of the travel demand model to configure the best system. ▪ Use of the Context Sensitive Solutions (CSS) process to communicate the need for combined benefits for both systems. ▪ Partnering with RTD and other local agencies.
Maintenance of Public Support at all Levels	▪ Open, honest, ongoing communication reaching diverse audiences using broadcast, print, and social media. ▪ Reliable defensible data including cost estimates, project ridership, etc. ▪ Transparency of the travel demand modelling. ▪ Inclusion of a broad spectrum of stakeholders in all key decisions. ▪ Early engagement of railroad companies to obtain accurate information on ROW usage, costs, feasibility, alternatives, etc. ▪ Success of FasTracks to obtain support for a new rail project. ▪ Early understanding and ongoing support among key political leaders, interest groups and media.	▪ 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. ▪ FasTracks delays or discontinuation of rail components of program. ▪ Lack of funding for HSIPR projects due to deficits.	▪ Inclusion of the mountain and front range communities in the decision making process through use of combined PLT and public workshops. ▪ Demonstrate transparent integration with the AGS study and I-70 Co-Development. ▪ Broad and effective public dissemination of findings. ▪ Public and stakeholder communication is used to drive proactive communication, generate support among the general public as well as key opinion leaders and qualified support groups.
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 (MOS) 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. ▪ Documented existing environmental clearances with a logical "Phased" plan to pursue additional environmental planning work.	▪ Insufficient engineering data to develop defensible ridership, capital and operating cost estimates. ▪ Communities cannot agree on who gets the first phase of a 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 are insufficient. ▪ Provide additional engineering design on the most difficult, high-cost segments. ▪ Include all communities in the selection of the MOS. ▪ Demonstrate MOS benefits. ▪ Robust engagement of railroads. ▪ Ensure feasibility of phased approach with all stakeholders, including railroad companies. ▪ CDOT has built trust and is positioned to referee and weigh in to resolve conflicts so MOS can move forward.

EXHIBIT 2-3
Goals, Critical Success Factors, 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. ▪ Demonstrate enhanced economic growth and development. ▪ Determine effective station locations have been determined. ▪ Support appropriate technologies/vehicles by stakeholders. ▪ Local efforts are maximized to plan, design, and implement infill development in station areas to capitalize on the presence of high capacity passenger transport. ▪ Improve mobility and access by siting stations in existing land use development nodes. ▪ Steady strengthening of the ridership in 20-50 year timeframe from incremental layering of development in station areas.	▪ 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 and mobility. ▪ People do not use the system because it is not convenient. ▪ Vehicle technology becomes political.	▪ 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.
Develop an Effective Project Funding and Financial Plan	▪ Project benefits are sufficient to develop state, regional, and local support for 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 technical capacity and capability to implement a major HSIPR program.	▪ Lack of political support for generating local funding or, local funding is simply not available. ▪ 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 with both the depth and breadth of support from qualified agency staff.

EXHIBIT 2-3
Goals, Critical Success Factors, Risks and Mitigations

Goal	Critical Success Factors	Risks	Mitigations
Incorporate HSIPR Planning into CDOT and other Public Transportation Plans	▪ CDOT and other public transportation plans take into account future HSIPR corridors and consider the feasibility of HSIPR along with other transportation modes. ▪ HSIPR planning becomes integrated with CDOT and other transportation and land use development plans.	▪ During the development of HSIPR, logical alignments and corridors are jeopardized by ongoing development and construction of highway and other projects.	▪ Communication of HSIPR corridors and identification of projects negatively impacting them, and either postponement of the threatening projects until HSIPR corridors are ultimately determined, or design modifications to preserve HSIPR future corridor utility. ▪ Have effective plans and processes to deal with risks as they surface and before they become overwhelming and threatening to the overall HSIPR program.
Where Corridors Involve Private Freight Railroads, the Present and Future Growth of Freight Rail Capacity, Along With Freight Customer Access and the Ability of Freight Railroads to Meet their Common Carrier Obligations, is Preserved and, Where Possible, Enhanced	▪ Open communication is maintained. ▪ Statewide economic development outlook is robust for freight carriers.	▪ Customers currently dependent on freight rail change to transporting freight on highways, causing more congestion and damage to state bridges and highways. ▪ Future employers requiring freight rail transportation must locate elsewhere. ▪ Either HSIPR developer or freight railroads are branded “overreaching” in efforts to protect their primary business interests.	▪ Negotiations involving key stakeholders, particularly private business interests, minimize public disclosure which undermines propriety business knowledge and competitive business advantages.

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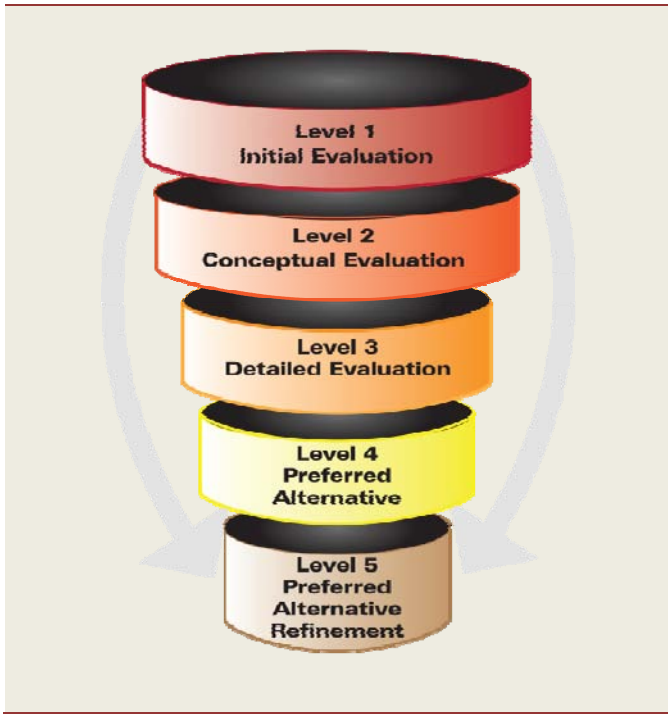
Section 3: Evaluation Process

Overview

As shown on **Exhibit 3-1**, the study approach for the Interregional Connectivity Study (ICS) involves three levels of evaluation, each characterized by increasing levels of analysis, as explained in this section. At Level 4 a Preferred Alternative is recommended for public comment. After the receipt of public comments the Preferred Alternative is refined and the recommendation is finalized at Level 5.

EXHIBIT 3-1
Alternatives Evaluation Process



The work of each level of evaluation culminates in a milestone. The results of each milestone are presented first to the internal Project Management (PMT) team, consisting of CDOT and regulatory agencies, then, secondly, to a Project Leadership Team (PLT), consisting of all local governments within the ICS study area. Comments are received and changes are made before the recommendations are presented to the public in four open houses—one in each city/region including: Fort Collins/NFR, Denver, Colorado Springs/Pikes Peak and Pueblo. Public comments are recorded and incorporated before starting the activities of the subsequent milestone. At each step the study team will gain endorsement on the relevant milestone products – for example at Level 1 Evaluation these products included:

- The draft Purpose and Need
- The evaluation criteria and process
- The segments used to configure 12 HSIPR alternative scenarios
- The evaluation finding for the segments and 12 HSIPR alternative scenarios
- The process used to collect public input on the segments and HSIPR alternative scenarios
- Recommendations for next steps

Key Milestones

The milestones are as follows:

- **Milestone 1 – Level 1 Evaluation, Development of Purpose and Need, Evaluation Criteria and HSIPR Alternative Scenarios:** The first step in Level 1 Evaluation was to prepare a draft Purpose and Need Statement, evaluation criteria, and twelve inital HSIPR alternative scenarios. Using qualitative criteria covering Purpose and Need, Transportation and Mobility Benefits, Other Public Benefits and Engineering Feasibility, a Level 1 Evaluation Report (this document) evaluated the advantages and disadvantages of possible segments and initial full alternative scenarios for HSIPR.

  If a segment or a scenario was generally defined as having impacts or costs deemed to be too high for implementation, it was set aside. The results were presented at public open houses referenced above. The degree of public support for each decision was documented and influenced the alternative scenarios to be modeled in Level 2 Evaluation.

- **Milestone 2 – Level 2 Evaluation**: The Level 2 Evaluation builds off of the technical analysis and public input from the Level 1 Evaluation. This level of evaluation involves a more quantitative assessment of the ridership, cost and environmental consequences of each of the alternative scenarios. For example, the alignment for each alternative scenario will be engineered to a level needed to document general right-of-way requirements, alignment and curvature to estimate train travel speeds, environmental and community impacts, and probable capital costs. Ridership numbers and fare box revenues will also be calculated to prepare initial benefit to cost relationships. The intent will be to reduce the number of HSIPR scenarios to three or four for more detailed scenarios at Level 3.

  The Level 2 results will allow the PMT, PLT, and the public to be better informed on the tradeoffs associated with each alternative scenario. For example, are the high community impacts and capital costs predicted for the urban alignments worth the increase in ridership, compared to possible lower ridership with routings that travel around highly developed areas?

  Or, it may be found that the potential for higher travel speeds allowed with the routing through less densely developed areas may actually increase ridership. The answers to these questions are key to the Level 2 Evaluation.

- **Milestone 3 – Level 3 Evaluation and Recommended Alternative:** In Level 3 analysis the remaining alternative scenarios are re-engineered to improve their performance, which is defined as increasing ridership, reducing costs and mitigating environmental impacts. A higher level of engineering will also allow more accurate estimates of community impacts and capital and operational costs. In turn, this information will improve the certainty of the benefit-to-cost relationships of the final or recommended HSIPR scenarios.

  The best performing alternative scenarios will then be presented to the PMT, PLT and public to determine the preferred HSIPR scenario for Colorado. Comments on the recommended alternative are received for incorporation in Milestone 4.

- **Milestone 4 – Refinement of the Recommended Alternative**: In this step the comments from the public are incorporated into the recommended alternative. The recommended alternative then becomes the Preferred Alternative.

Evaluation Criteria

The evaluation criteria for the ICS study are presented in **Exhibits 3-2** and **3-3**. The Level 1 criteria were presented at two PLT meetings and at four public open houses. It is anticipated that the Level 2 and 3 criteria may be refined further as they are presented to the PLT and public, as the alternative scenarios move through Level 2 and Level 3 Evaluations.

At this point the Level 2 and 3 criteria are largely based on *DOT FRA High Speed Intercity Passenger Rail Program Federal Register/Vol. 75, No 126/July 1, 2010/Notices.*

EXHIBIT 3-2
Level 1 Evaluation Criteria

Criteria	Measure
Public Benefits	
▪ Fulfills the Problem Statement	Yes or No
▪ Public Support	Based on Public Workshop comments
▪ Transportation & Mobility – One-seat ride: • Mountains • DIA (describe for one-seat ride) • DUS (describe for one-seat ride)	**One-seat ride:** Qualitative at Level 1
– Travel time: • Faster than an auto outside the metro area (north – south) • Faster than RTD inside the metro area • Meets FRA criteria for an "emerging corridor' (90-110 mph)	**Travel time:** Qualitative at Level 1
▪ Population Served	▪ Quantitative using GIS
Other Public Benefits	
▪ Potential for Environmental Impact	▪ Narrative description of consequences on the human versus ecological environment.
▪ Safety ▪ Rail-Rail Crossings ▪ At-Grade Crossings	▪ Narrative description of consequence.
Engineering and Institutional Feasibility	
▪ Probable high capital cost ▪ Length ▪ Number of new or existing highway/rail structures affected ▪ Probable quantity of elevated structure ▪ Use of existing infrastructure ▪ Probable high operating cost	▪ Qualitative at Level 1
▪ Feasibility/Constructability ▪ Tunnels ▪ Access to DUS ▪ Freight Conflicts ▪ Capacity on existing freight corridor	▪ Narrative description of consequence for entering DUS
▪ Technology ▪ Limits choices ▪ Compatibility	▪ Narrative description of consequence.

EXHIBIT 3-3
Levels 2 and 3 Evaluation Criteria

Criteria	Measure
Public Benefits	
▪ Fulfilment of Purpose and Need ▪ Governance and stakeholder support	▪ Qualitative Narrative ▪ Based on PLT and Public Comments
▪ Public support	▪ Qualitative Narrative
▪ Agency support	▪ Qualitative Narrative
▪ CDOT Regional support	▪ Qualitative Narrative
▪ RTD support	▪ Qualitative Narrative
Transportation Benefits	
▪ Captures system ridership	▪ Quantitative – Model results
▪ Supports development of intercity HSIPR service	▪ Qualitative Narrative
▪ Generates cross-modal benefits – including favorable impacts on highway and aviation congestion	▪ Quantitative – VMT reduction
▪ Creates an integrated HSIPR network, including integration with existing intercity passenger rail service	▪ Qualitative Narrative
▪ Encourages of intermodal connectivity though the provision of direct transfers among intercity transit networks	▪ Quantitative with qualitative narrative support
▪ Enhances intercity travel options	▪ Qualitative Narrative
▪ Ensures a state of good repair of key intercity passenger rail assets	▪ Shared systems only - Qualitative Narrative
▪ Promotes standardized rolling stock, signaling, communications and power equipment	▪ Qualitative Narrative
▪ Improves freight and/or commuter rail operations	▪ Qualitative Narrative
▪ Equitable financial participation including consideration of donated property or services, financial contributions by freight and commuter rail carriers commensurate with benefits received	▪ Qualitative Narrative
▪ Encourages Positive Train Control (PTC) implementation	▪ Qualitative Narrative
▪ Incorporates private investment in the financing of the project	▪ Qualitative Narrative
▪ Promotes equity of service	▪ Qualitative Narrative
Other Public Benefits	
▪ Enhances environmental quality and energy efficiency ▪ Reductes dependence on foreign oil, including the use of renewable resources ▪ Uses green building and manufacturing methods ▪ Reduces key emission types ▪ Purchase and use of green materials and equipment	▪ Quantitative based on VMT reduction ▪ Green building information will be qualitative narrative.
▪ Promotes livable communities, complementing local governmental efforts to promote efficient land use planning	▪ Qualitative Narrative
▪ Improves historic transportation facilities	▪ Qualitative Narrative
▪ Creates jobs and stimulates the economy (the project is expected to quickly create and preserve jobs and stimulate rapid increases in economic activity)	▪ Quantitative

EXHIBIT 3-3
Levels 2 and 3 Evaluation Criteria

Criteria	Measure
▪ Probable overall environmental impact or benefit: – Acres disturbed – Air quality – Noise – Energy and congestion – Initial and permanent employment changes – Land use and development effects, including TOD potential – Reliability – Safety benefits – Historic properties – Park and recreation facilities – Wetlands and water resources – Benefits and cost evaluation	▪ Quantitative
Engineering and Institutional Feasibility	
▪ Capital Cost	▪ Quantitative
▪ Operating Cost	▪ Quantitative
▪ Cyclic Capital Cost	▪ Quantitative
▪ Right-of-Way Costs	▪ Quantitative
▪ Requires multiple technologies	▪ Qualitative Narrative
▪ Availability of technology	▪ Qualitative Narrative
▪ Ability to phase	▪ Qualitative Narrative
Planning Feasibility	
▪ Consistent with the State Rail Plan	▪ Qualitative Narrative
▪ Consistency with Regional Transportation Plans	▪ Qualitative Narrative
▪ Consistent with local land use planning	▪ Qualitative Narrative
▪ General potential for TOD	▪ Qualitative Narrative

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Section 4: Segments and Scenarios Considered

Development of Segments and Scenarios

The development of alternative scenarios for the HSIPR system involved building on the work done in past studies including use of performance criteria and incorporating FRA requirements. A three-step process was followed:

- **Step 1:** Defining possible segments through the Denver metropolitan area, where a segment is defined as a possible route between two points.
- **Step 2:** Identifying possible segments to the north to Fort Collins and to the south to Colorado Springs and Pueblo.
- **Step 3:** Developing the best-performing HSIPR alternative scenarios using the best segments.

Note: A segment is a possible route between two points (e.g., DUS to DIA) in a smaller geography. Combinations of segments make up the HSIPR alternative scenarios. **Exhibit 4-1** lists the name of the segments by geographical area. The names of alternative scenarios are shown in **Exhibit 4-2**.

Building on Previous Studies

The concept of HSIPR has been addressed in CDOT's State Rail Plan, the RMRA High-Speed Rail Feasibility Study, and the I-70 Mountain Corridor Programmatic Environmental Impact Statement (EIS).

Several other key studies have discussed the desire to include rail transit as part of their future vision. These include the North I-25 EIS, the East Corridor EIS, and the Regional Transportation Plans developed by the four metropolitan planning organizations in the

EXHIBIT 4-1
ICS Segment Names by Geographic Area

Segment Names

WEST
- W-1: US 6/Gold Line/DUS
- W-2: I-70/I-76/DUS
- W-3: I-70/New Stockyard Station
- W-4: I-70/US 6/DUS

EAST
- E-1: DUS/CML/I-70/East Corridor/DIA
- E-2: DUS/CML/I-70/Pena Blvd/DIA
- E-3: New Stockyard Station/I-70/Pena Blvd./DIA
- E-4: DUS/CML/96th Avenue/DIA

NORTH/SOUTH
- NS-1: CML
- NS-2: CML and Joint Line

BELTWAY
- B-1: Northwest Quadrant
- B-2: Southwest Quadrant
- B-3: Southeast Quadrant
- B-4: Northeast Quadrant

NORTH METRO
- N-1: Railroad Alignment
- N-2: Greenfield

SOUTH METRO
- S-1: Railroad Alignment
- S-2: Greenfield

EXHIBIT 4-2
ICS Alternative Scenarios

Alternative Scenarios

A- SERIES: Through the Denver Metropolitan Area
- A-1: Direct Alignments through Denver
- A-2: Beltway Excluding Southwest Quadrant
- A-3: Beltway Excluding Northwest Quadrant
- A-4: Western Beltway
- A-5: Eastern Beltway
- A-6: Complete Beltway

B- AND C- SERIES: RTD as Collector /Distributor
- B-1: Denver Periphery
- B-2: Denver Periphery Excluding SE Quadrant
- B-2A: Denver Periphery Excluding NW Quadrant
- B-3: Denver Periphery Eastern Beltway
- B-4: Denver Periphery Full Beltway
- C-1: Shared Track with RTD

study area: Denver Regional Council of Governments, Pikes Peak Area Council of Governments, North Front Range Metropolitan Planning Organization, and Pueblo Area Council of Governments.

The impact of these previous studies on the alternative scenarios evaluated in the ICS is summarized in **Exhibit 4-3**.

Performance-Based Criteria

Each of the segments was evaluated using the criteria presented in Section 3. These include performance measures for fulfilling the Purpose and Need, Transportation and Mobility, Public Benefits, Engineering Feasibility, and the ability to accommodate innovative technologies.

FRA Requirements

FRA guidelines for route development were used to develop representative segments for HSIPR alternative scenarios. FRA has produced a technical working paper, *Railroad Corridor Transportation Plans (RCTP), A Guidance Manual, Section II,* that provides practical suggestions and policy guidance to aid in selecting appropriate high speed rail alignments. The five basic criteria are:

- Geometry (horizontal and vertical curves) that affects speed and travel time
- Capacity
- Proximity to population centers
- Proximity to intermodal sites
- Cost of improvements

Description of Level 1 Segments

Segment Descriptions

Segments were selected within the Denver metropolitan area, north to Fort Collins, and south to Colorado Springs and Pueblo. The segments were then combined to configure the alternative scenarios described later in this section.

Denver Metropolitan Area Segments

The Denver metropolitan area is anticipated to be one of the most difficult areas to configure a HSIPR alignment because of high-density urban development, lack of available public ROW, and the presence of bridges and other existing infrastructure. The segments evaluated for this portion of the study area were grouped into four categories:

- I-70/C-470 to Central Denver
- Central Denver to DIA
- North Denver to South Denver
- Beltways (around the Denver metropolitan area)

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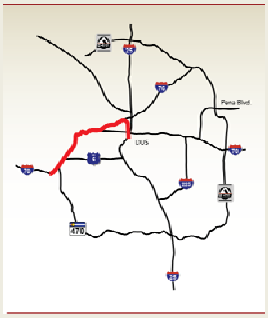
EXHIBIT 4-3
ICS Summary

Segment	Segment Reference Name in the ICS	Study Where Recommended
BNSF rail alignment from the end-of-line station of the future RTD North Metro Commuter Rail running north through Longmont and Loveland, to Fort Collins	North (N)-1	CDOT North I-25 EIS
I-25 "greenfield" segment from E-470 along I-25 to Fort Collins	N-2	RMRA High-Speed Rail Feasibility Study
Consolidated mainline running to DUS from the north	North-South (NS)-1	RMRA High-Speed Rail Feasibility Study
Joint line running south from DUS to Littleton	NS-2	RMRA High-Speed Rail Feasibility Study
US 6 from C-470/I-70 to DUS	West (W)-4	RMRA High-Speed Rail Feasibility Study
E-470 from DIA to I-25 north	Beltway (B)-4	RMRA High-Speed Rail Feasibility Study
BNSF rail alignment from Littleton to Pueblo	South (S)-1	RMRA High-Speed Rail Feasibility Study
Greenfield segment from south Denver metropolitan area to Pueblo	S-2	RMRA High-Speed Rail Feasibility Study

I-70/C-470 to Central Denver Segments

A description of the segments included in each category is presented below. Four segments were defined from I-70/C-470 east to Central Denver, as shown in **Exhibit 4-4**

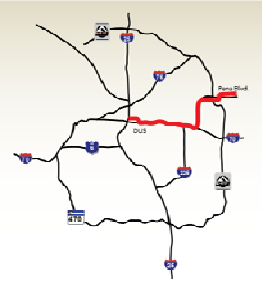
EXHIBIT 4-4
I-70/C-470 to Central Denver Segments

Segment	Configuration	Segment Description	Miles
W-1: US 6/Gold Line/ DUS		From I-70/C-470, this segment follows US 6 to Golden, then turns east on the BNSF alignment near the Coors Brewery, and follows the BNSF alignment to Ward Road where it meets up with the Gold Line rail alignment, which is parallel to DUS.	21.6
W-2: I-70/I-76/DUS		From I-70/C-470, this segment follows I-70 east to I-76 at Wadsworth Boulevard to Pecos Street, then turns south at Utah Junction through the rail yards paralleling the RTD Gold Line rail alignment to DUS.	18.5
W-3: I-70/New Stockyard Station		From I-70/C-470, this segment follows I-70 east to I-25, flies over the highway to the south of 48th Avenue, travels east and flies over the CML and RTD North Metro Commuter Rail tracks, then parallels the Rock Island Line to a new Stockyard Station adjacent to the North Metro Stockyard Station.	16.5
W-4: I-70/US 6/ DUS		From I-70/C-470, this segment follows US 6 to and over I-25 to the CML where it is carried on structure over the freight rail alignment to the existing LRT terminal station (800 feet west of DUS) at DUS. Similar to LRT travellers, connection from the station to the DUS terminal would be provided by the extension of the 16th Street Mall shuttle.	13.3

Central Denver to DIA Segments

Four segments were defined from Central Denver east to DIA, as shown in **Exhibit 4-5**.

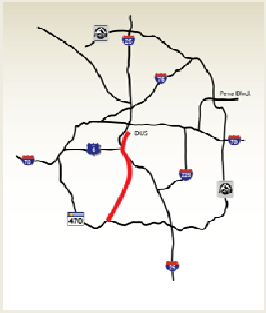
EXHIBIT 4-5
Central Denver to DIA Segments

Segment	Configuration	Segment Description	Miles
E-1: DUS/CML/ I-70/East Corridor/DIA		From DUS, this segment follows the CML to I-70 near Brighton Blvd, then merges with the highway alignment to Colorado Blvd where it travels south to RTD's East Line rail alignment east to Pena Blvd, then to DIA.	23.6
E-2: DUS/CML I-70/Pena Blvd/DIA		From DUS, this segment follows the CML to I-70 near Brighton Blvd and remains on the I-70 alignment to Pena Blvd, then to DIA.	22.6
E-3: New Stockyard Station/I-70/ Pena Blvd/DIA		This segment bypasses DUS. From a new Stockyard Station, this segment is essentially the same as E-2, remaining on the I-70 alignment to Pena Blvd and DIA.	20.1
E-4: DUS/CML/96th Avenue/DIA		From DUS, this segment follows the CML/Brush lines to 96th Avenue where it then travels east along 96th Avenue over E-470, then turns south to DIA.	24.3

North Denver to South Denver Segments

Only two segments were defined through the Denver metropolitan area from north to south. Both segments follow existing freight railroad alignments, as shown in **Exhibit 4-6**.

EXHIBIT 4-6
North Denver to South Denver

Segment	Configuration	Segment Description	Miles
NS-1: CML		From the RTD North Metro end-of-line station in Thornton, this segment travels south on the CML to DUS. It is assumed that the HSIPR would not share track with the freight rail system due to capacity constraints.	24.7
NS-2: CML and Joint Line		From DUS, this segment travels south on the CML and Joint Line to C-470 in Littleton. It is assumed that the HSIPR would not share track with the freight rail system due to capacity constraints.	14.5

Beltway Segments

Four segments were defined around the Denver metropolitan area, as shown in **Exhibit 4-7**. These segments were evaluated to show the effects of bypassing the Denver metropolitan area versus traveling directly though it.

EXHIBIT 4-7
Beltway Segments

Segment	Configuration	Segment Description	Miles
B-1: Northwest Quadrant		From C-470/I-70, this segment follows US 6 to Colorado 93 north to greenfield (anticipated northwest quadrant highway alignment), and the Northwest Parkway to I-25.	31.0
B-2: Southwest Quadrant		From C-470/I-70, this segment follows C-470 southeast to I-25.	26.3
B-3: Southeast Quadrant		From I-25, this segment follows E-470 north to DIA.	28.0
B-4: Northeast Quadrant		From I-25, this segment follows E-470 south to DIA.	19.9

Denver to Fort Collins Segments

Two segments were defined from Denver north to Fort Collins, as shown in **Exhibit 4-8.** The N-1: Railroad Alignment segment is from the North I-25 EIS, where it is included as a commuter rail project as one component of the preferred alternative in the Record of Decision. The N-2: Greenfield segment is from the RMRA High-Speed Rail Feasibility Study.

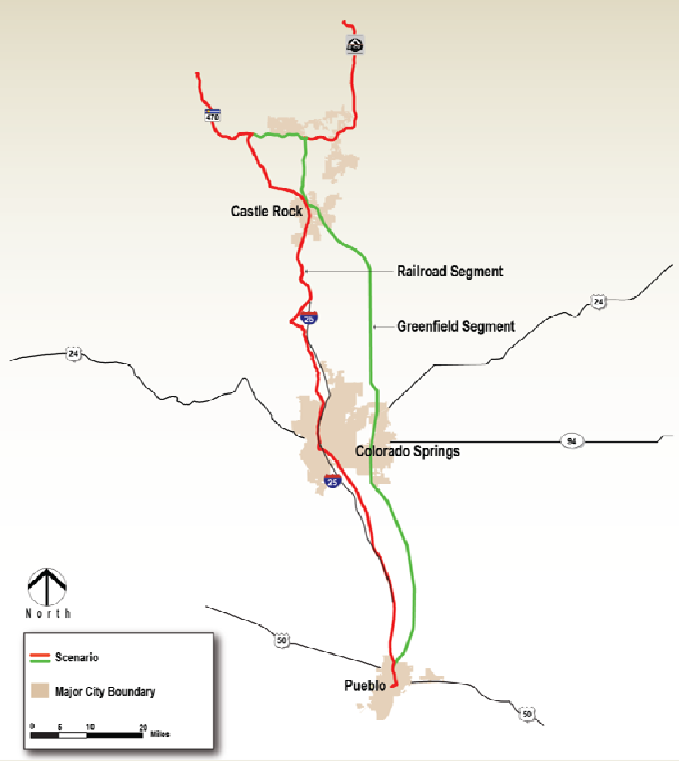
EXHIBIT 4-8
Denver to Fort Collins Segments

Segment	Configuration	Segment Description	Miles
N-1: Railroad Alignment Segment		From the RTD North Metro end-of-line station at 162nd Avenue in Thornton, this segment travels over I-25 northwest following the UPRR ROW, then travels north on the west side of County Road (CR) 7 to the south side of SH 119, then west to the BNSF rail alignment through Longmont, Loveland, and to Fort Collins. It is possible that the HSIPR could share track with freight rail in some locations. The segment would terminate at the MAX Transit Center south of Harmony Road.	49.2
N-2: Greenfield Segment		From the Northwest Parkway/I-25 interchange, this segment travels north to Fort Collins along I-25 and ends near Harmony Road and I-25. It would not continue into Fort Collins.	45.5

Denver to Colorado Springs and Pueblo Segments

Two segments were defined from Denver south to Colorado Springs and Pueblo, as shown in **Exhibit 4-9**. Both the S-1: Railroad Alignment and S-2: Greenfield segments are from the RMRA High-Speed Rail Feasibility Study.

EXHIBIT 4-9
Denver to Colorado Springs and Pueblo Segments

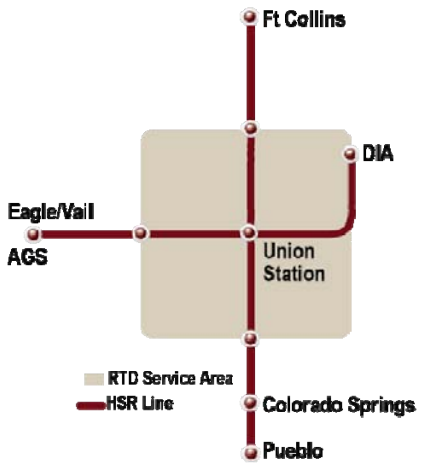
Segment	Configuration	Segment Description	Miles
S-1: Railroad Alignment Segment		From south Denver, this segment follows the BNSF/UPRR rail alignment through Colorado Springs to Pueblo. It is assumed that the HSIPR would not share track with the freight rail system due to capacity constraints. Because the BNSF track has fewer curves than the parallel UPRR track, fewer easements would be required to improve this segment. Therefore, from Littleton to Pueblo, the S-1 segment is anticipated to follow the BNSF rail alignment.	105.0
S-2: Greenfield Segment		From E-470, this segment follows I-25 to Castle Rock, then leaves the highway ROW near Santa Fe Drive in Castle Rock and travels to the southeast. The segment heads south roughly parallel and approximately 11 miles to the east of I-25. At Monument, the segment is about 9 miles east of I-25 where it continues south to the Colorado Springs Airport. From this point, the segment travels south, generally within 3 to 4 miles to the east of I-25 until it terminates in Pueblo.	98.5

Alternative Scenario Descriptions

A-Series Alternative Scenarios: Through the Denver Metropolitan Area

The intent of the A-series is to run directly through the Denver metropolitan area with the shortest routes and potentially fastest travel times possible. The A-series scenarios may have direct alignments, east/west, north/south, or both. These alternative scenarios are all challenged by limited ROW through the urban area, requiring elevated structure or acquisition of new dedicated ROW. The alternative scenarios will be costly to construct because of the need to build on structure to minimize ROW takes or acquire private property for ROW. The six alternative A-series scenarios are described below. Alternative Scenario A-1: Direct Alignments through Denver.

Alternative Scenario A-1
(also see Exhibit 4-10 on the following page)



Technology

Both FRA compliant and non-compliant technologies are possible.

Segments Considered

- **East/ West:** For the purposes of modeling, segment E-3: I-70 to DIA was used for the eastern segment. However, there are at least two other segments from the west to central Denver: W-3: I-70/New Stockyard Station or W-4: I-70/US 6/DUS.
- **North/ South**: Segments NS-1: CML and NS-2: CML and Joint Line, together travel through the Denver metropolitan area.
- **Outside of the Denver Metropolitan Area**: Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

Using the W-3: I-70/New Stockyard Station and E-3: I-70/Pena Blvd/DIA segments, this alternative scenario travels from west to east through Denver along I-70, over I-25 to the Rock Island Branch line, then back to I-70 and on to DIA. The north/south segments, NS-1: CML and NS-2: CML and Joint line, follow the existing Brush Line and CML from E-470 to Littleton. A new Stockyard Station would be provided adjacent to the proposed RTD North Metro Commuter Rail.

Using the W-4: I-70/US 6/DUS segment is a design option that will also need to be considered in order to evaluate the ridership impacts and community impacts of stopping or not stopping at DUS.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 76 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 230 miles
- Total with greenfield segments = 220 miles

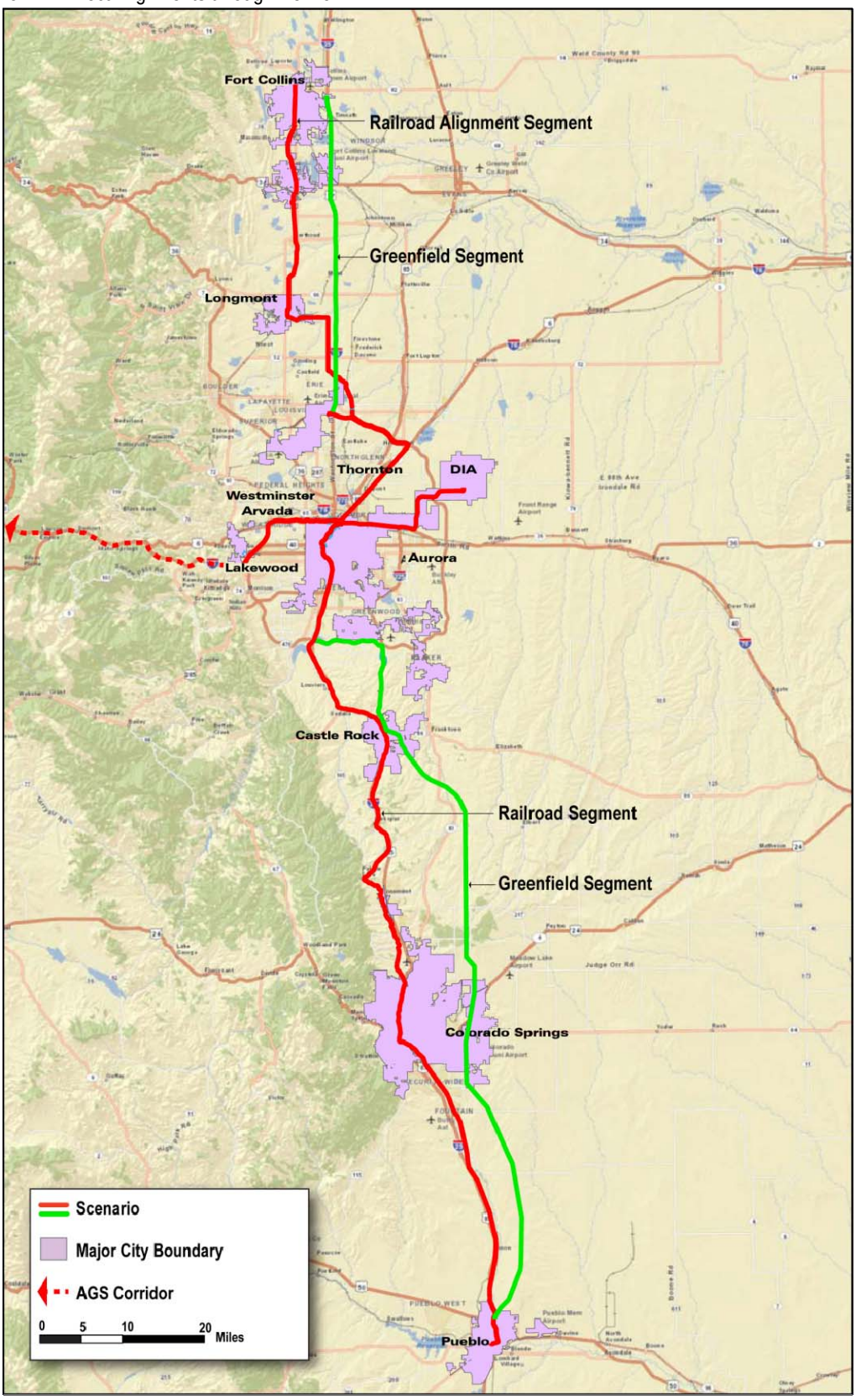
Stations

At a minimum, this alternative scenario would have stations at DIA, Stockyard Area (or DUS), North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

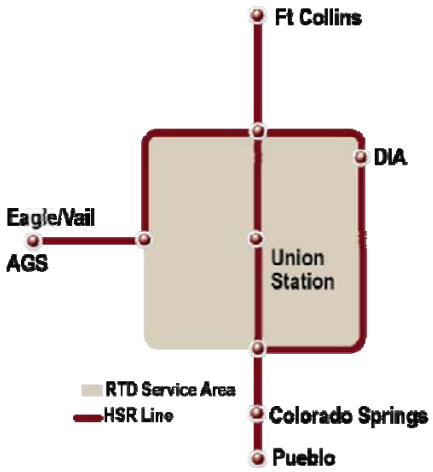
This alternative scenario would provide line-haul service with stops at DIA, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins. A stop at DUS is a design option that should be modeled.

EXHIBIT 4-10
Alternative Scenario A-1: Direct Alignments through Denver



Alternative Scenario A-2: Beltway Excluding Southwest Quadrant

Alternative Scenario A-2
(also see Exhibit 4-11 on the following page)



Technology

Both FRA compliant and non-compliant technologies are possible.

Segments Considered

- **East/ West:** There are two segments that allow east/west travel: B-1: NW Quadrant and B-4: NE Quadrant.
- **North/ South**: Segments B-3: SE Quadrant plus NS-1: CML and NS-2: CML and Joint Line allow for north/south travel.
- **Outside of the Denver Metropolitan Area**: Northern segments are N-1 or N-2, and southern segments are S-1 and S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

This alternative scenario travels from I-70/C-470 to a new alignment along the Northwest Corridor to the Northwest Parkway, then to E-470 and on to DIA. The north/south alignment is the same as for Alternative Scenario A-1.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 119 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area= 144 miles
- Total with railroad alignments = 273 miles
- Total with greenfield segments = 263 miles

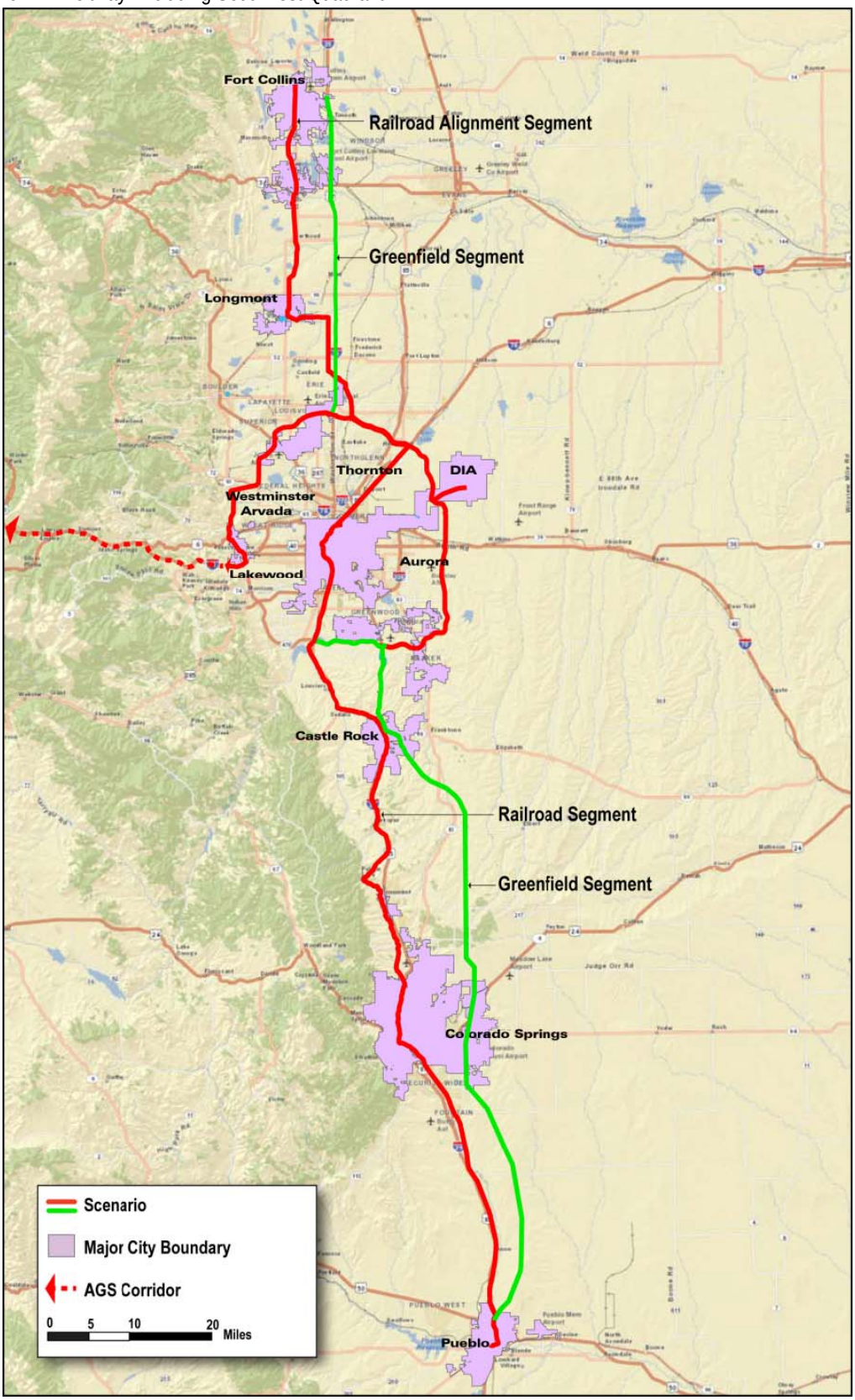
Stations

At a minimum, this alternative scenario would have stations at DIA, DUS, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

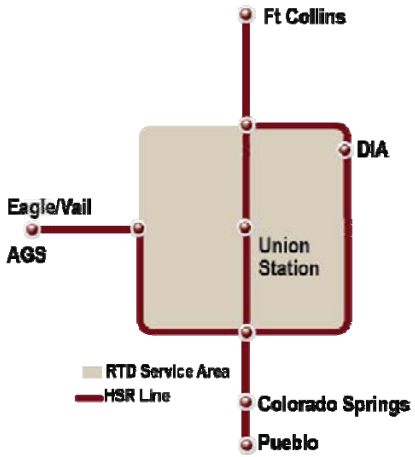
This alternative scenario would provide line-haul service with stops at the same stations referenced above.

EXHIBIT 4-11
Alternative Scenario A-2: Beltway Excluding Southwest Quadrant



Alternative Scenario A-3: Beltway Excluding Northwest Quadrant

Alternative Scenario A-3
(also see Exhibit 4-12 on the following page)



Technology
Both FRA compliant and non-compliant technologies are possible.

Segments Considered
- **East/ West:** There are three segments that allow east/west travel – B-2: SW Quadrant, B-3: SE Quadrant and B-4: NE Quadrant..
- **North/ South**: Segments B-3: SE Quadrant plus NS-1: CML and NS-2: CML and Joint Line allow for north/south travel.
- **Outside of the Denver Metropolitan Area**: Northern segments are N-1 or N-2, and southern segments are S-1, S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative senarios.

Segment Combinations to be Evaluated in Level 2 Evaluation
This alternative scenario travels from I-70/C-470 south and east to E-470 and on to DIA.

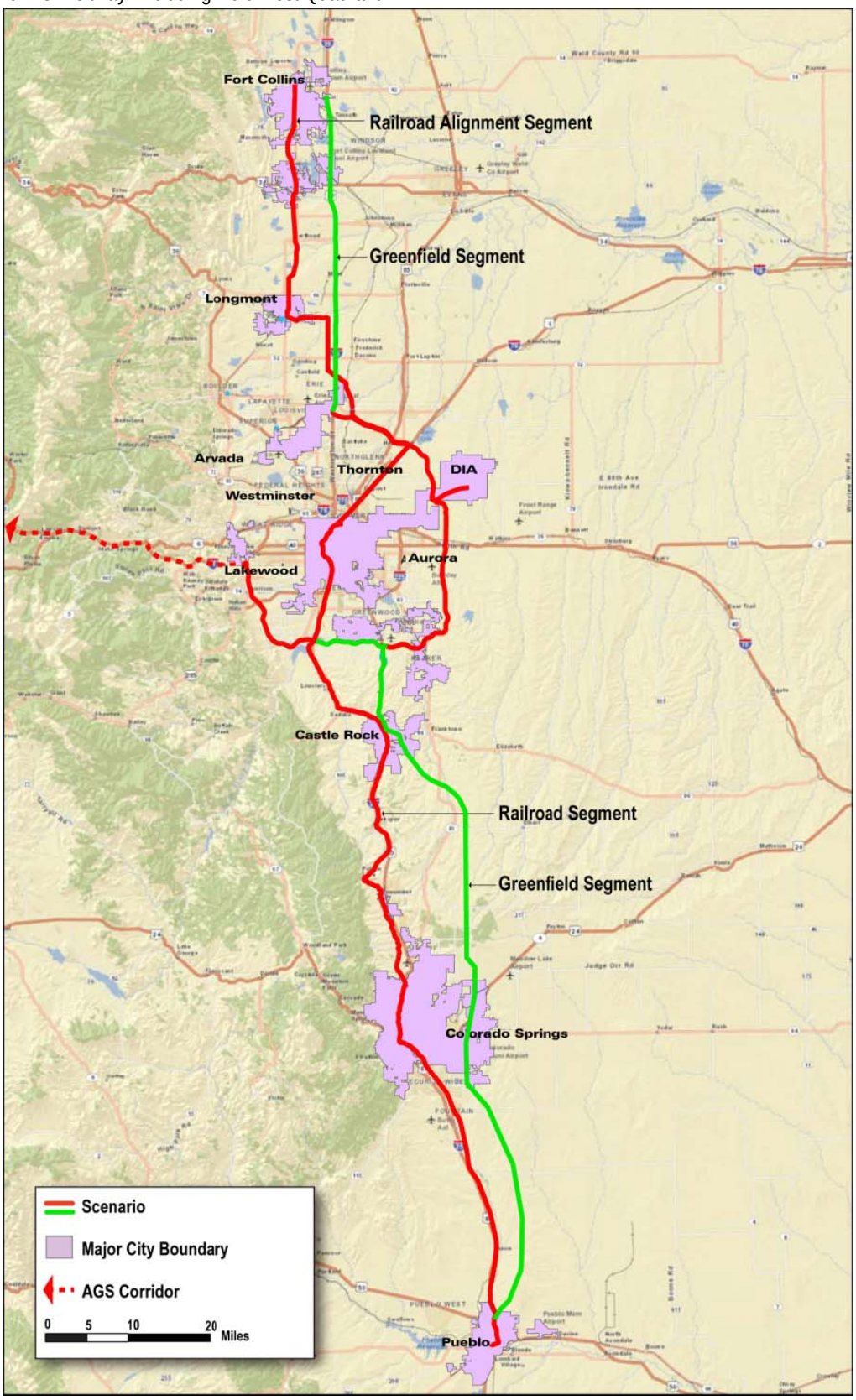
Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length
- Denver metropolitan area = 114 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 268 miles
- Total with greenfield segments = 258 miles

Stations
At a minimum, this alternative scenario would have stations at DIA, DUS, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

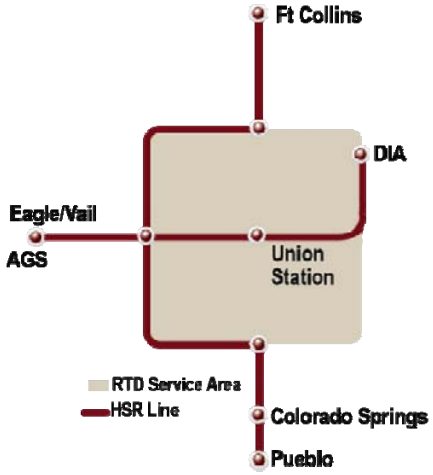
Operating Strategy
This alternative scenario would provide line-haul service with stops at the same stations referenced above.

EXHIBIT 4-12
Alternative Scenario A-3: Beltway Excluding Northwest Quadrant



Alternative Scenario A-4: Western Beltway

Alternative Scenario A-4
(also see Exhibit 4-13 on the following page)



Technology

Both FRA compliant and non-compliant technologies are possible.

Segments Considered

- **East/ West**: Same segments as described for Alternative Scenario A-1. The two East/West design options for Alternative Scenario A-4 are the same as for Alternative Scenario A-1.
- **North/ South**: Segments B-1: NW Quadrant and B-2: SW Quadrant allow for north/south travel.
- **Outside of the Denver Metropolitan Area**: Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

B-3: SE Quadrant

Traveling from the west, this alternative scenario follows a new segment through the NW Quadrant to the north. Travelling south, the alignment follows C-470 to Littleton. The east-west segments are the same as described for A-1.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 93 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 247 miles
- Total with greenfield segments = 237 miles

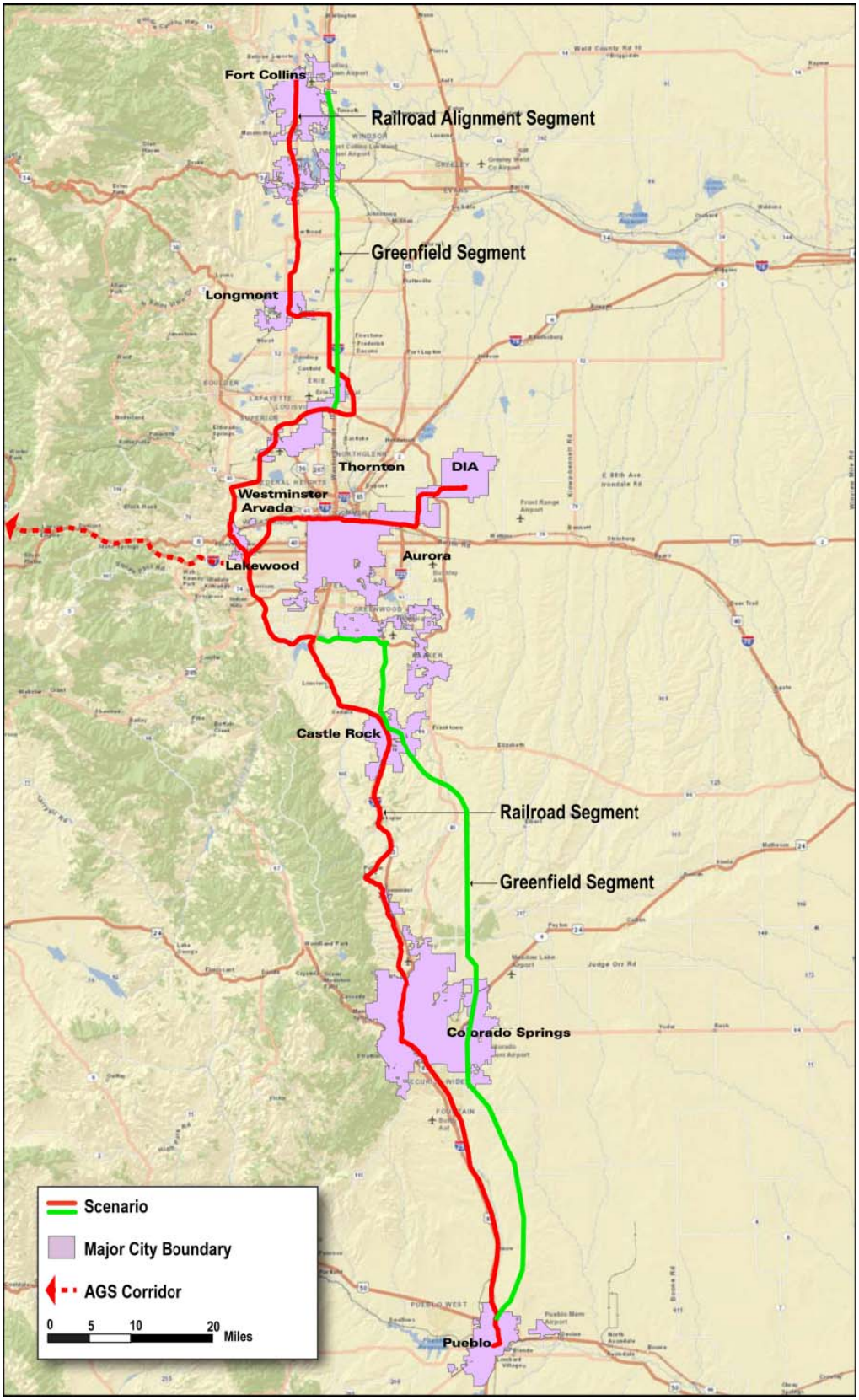
Stations

At a minimum, this alternative scenario would have stations at DIA, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins. A stop at the stockyard area or DUS is a design option.

Operating Strategy

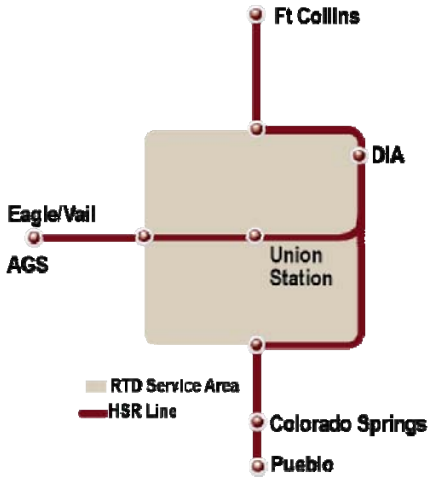
This alternative scenario would provide line-haul service with stops at the same stations as listed above.

EXHIBIT 4-13
Alternative Scenario A-4: Western Beltway



Alternative Scenario A-5: Eastern Beltway

Alternative Scenario A-5
(also see Exhibit 4-14 on the following page)



Technology

Both FRA compliant and non-compliant technologies are possible.

Segments Considered

- **East/ West:** Same segments as described for Alternative Scenario A-1. This alternative scenario has the same two East/West options as described for Alternative Scenario A-1 and Alternative Scenario A-4.
- **North/ South:** Segments B-4: NE Quadrant and B-3: SE Quadrant allow for north/south travel.
- **Outside of the Denver Metropolitan Area:** Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

This alternative scenario travels north to south from I-25 along the existing E-470 alignment. The east-west segments are the same (along with the same design options) as described for Alternative Scenario A-1. A new station would be provided in the vicinity of the Stockyards.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 84 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 238 miles
- Total with greenfield segments = 228 miles

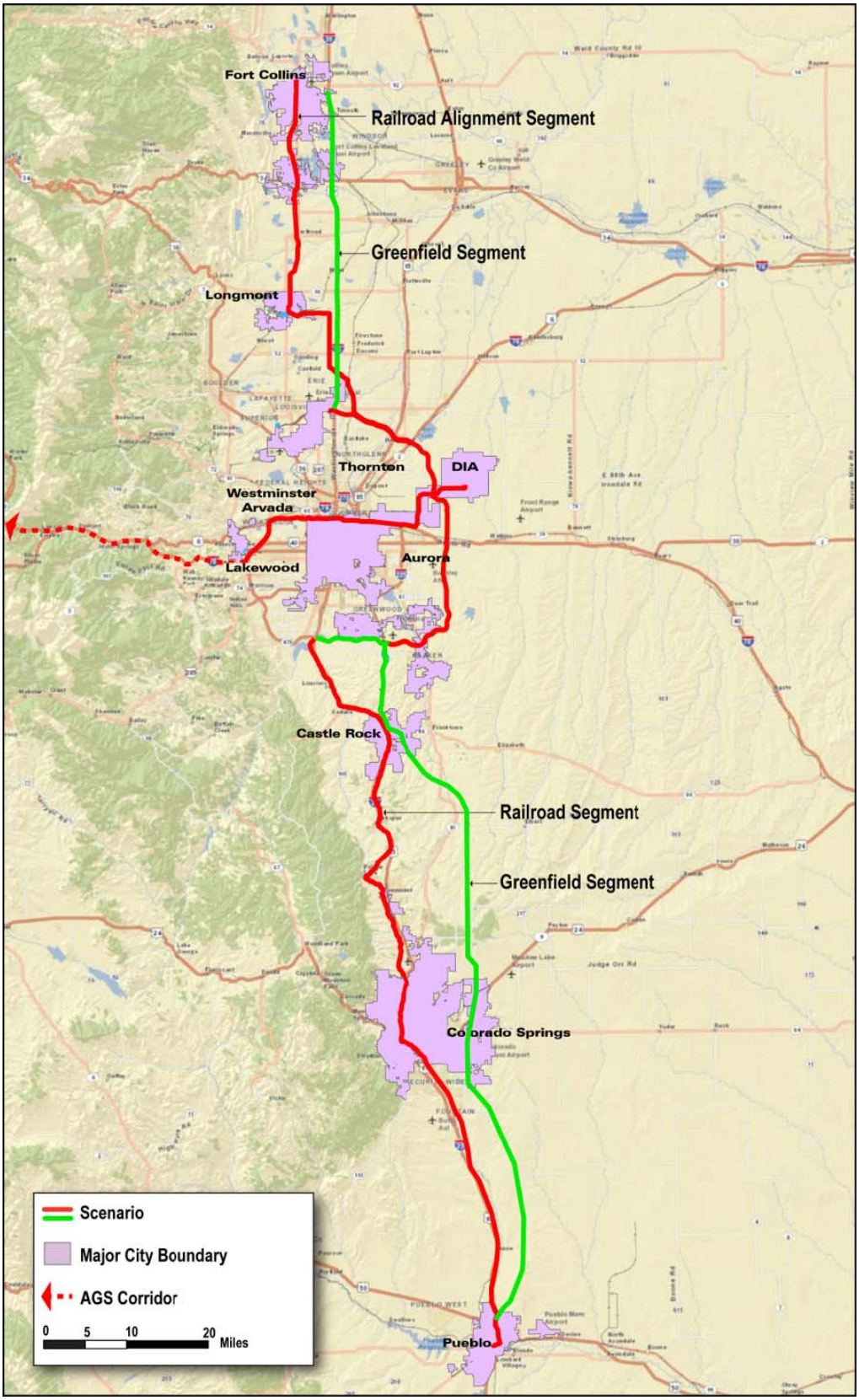
Stations

At a minimum, this alternative scenario would have stations at DIA, DUS or stockyard area, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

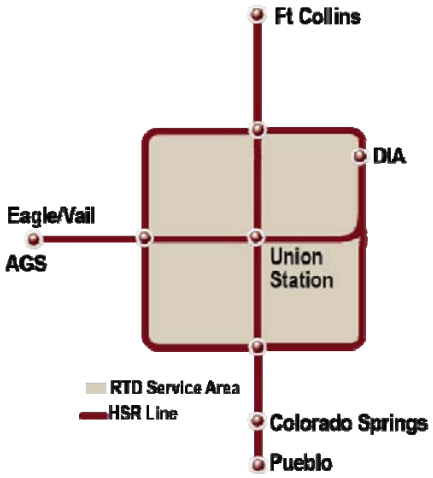
This alternative scenario would provide line-haul service with stops at the same stations as listed above.

EXHIBIT 4-14
Alternative Scenario A-5: Eastern Beltway



Alternative Scenario A-6: Complete Beltway

Alternative Scenario A-6
(also see Exhibit 4-15 on the following page)



Technology

Both FRA compliant and non-compliant technologies are possible.

Segments Considered

- **East/ West**: Same segments as described for Alternative Scenario A-1. This alternative scenario has the same two East/West design options as described for Alternative Scenario A-1, Alternative Scenario A-4, and Alternative Scenario A-5 in the east-west direction.
- **North/ South**: Segments NS-1: CML, NS-2: CML and Joint Line, plus segments B-1, B-2, B-3, and B-4 allow for north/south travel.
- **Outside of the Denver Metropolitan Area:** Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

This alternative scenario uses the same east/west and north/south segments as Alternative Scenario A-1 and includes beltway segments around all four quadrants of the Denver metropolitan area.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 181 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 335 miles
- Total with greenfield segments = 325 miles

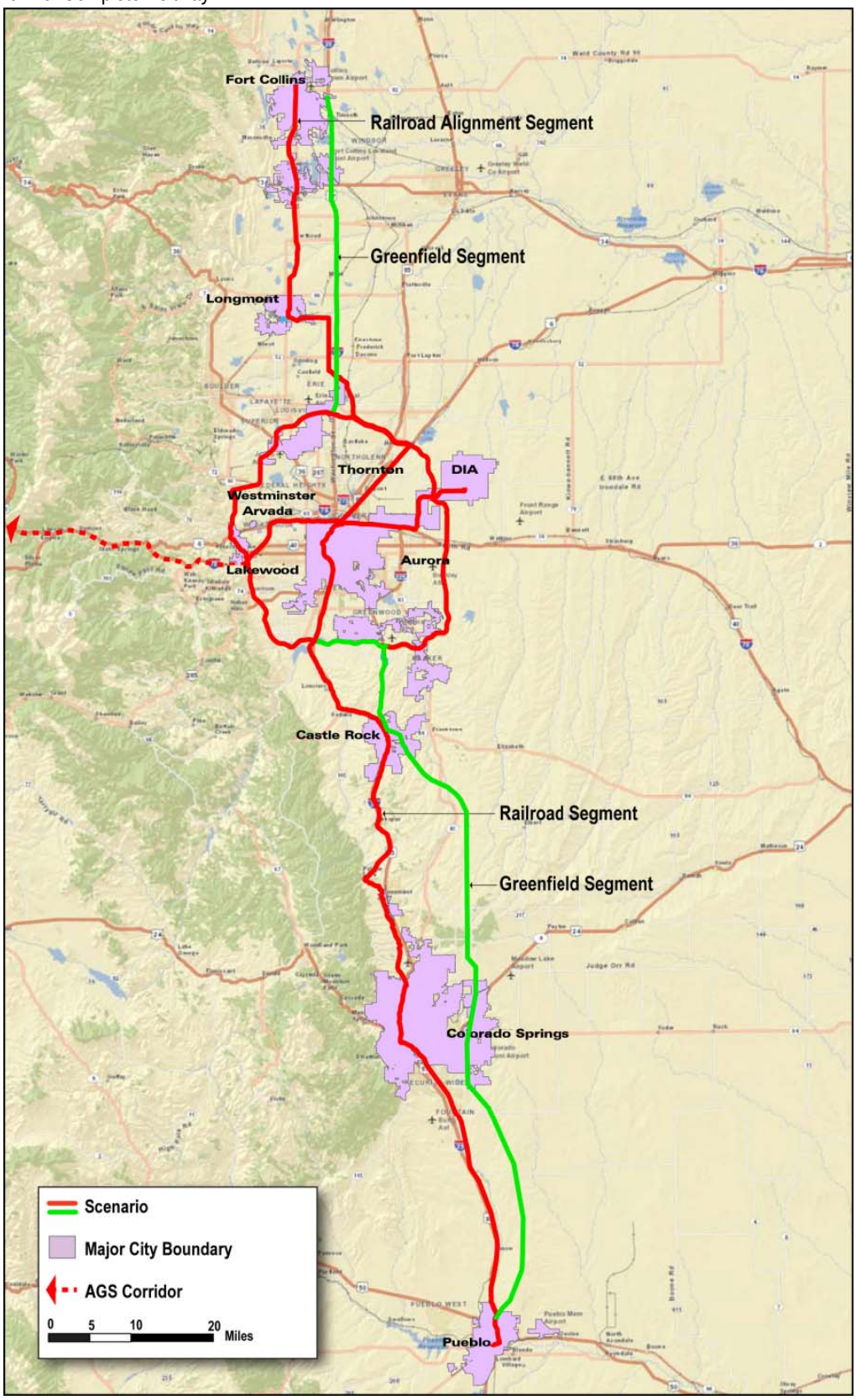
Stations

At a minimum, this alternative scenario would have stations at DIA, DUS, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

This alternative scenario would provide line-haul service with stops at the same stations as listed above.

EXHIBIT 4-15
Alternative Scenario A-6: Complete Beltway

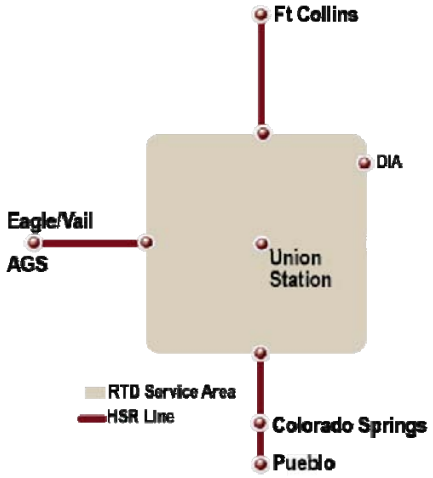


B-Series and C-Series Alternative Scenarios: RTD as Collector/Distributor

The intent of the B- and C-series alternative scenarios is to test the impact on HSIPR performance or operations on the periphery of the Denver metropolitan area. These alternative scenarios offer the advantage of fewer impacts to the urban area and lower construction costs. The six B- and C-series alternative scenarios are described below.

Alternative Scenario B-1: Denver Periphery

Alternative Scenario B-1
(also see Exhibit 4-16 on the following page)



Technology

Outside the Denver metropolitan area, both FRA compliant and non-compliant vehicles could be used. Inside the RTD service area, RTD technologies would be used.

Segments Considered

- **East/ West**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system.
- **North/South**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system.
- **Outside of the Denver Metropolitan Area:** Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

No new HSIPR infrastructure would be constructed in the Denver metropolitan area for this alternative scenario.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 0 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 154 miles
- Total with greenfield segments = 144 miles

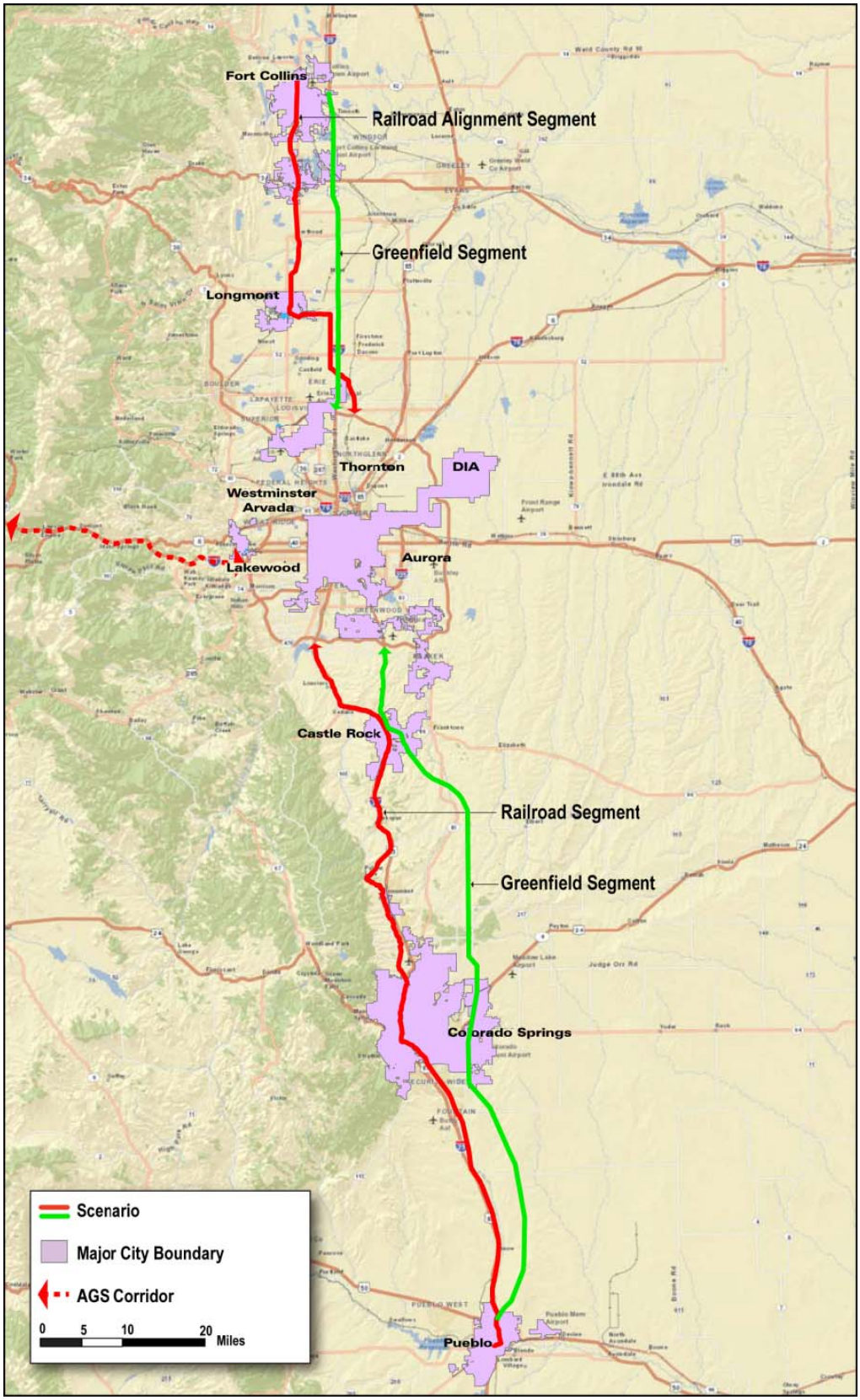
Stations

At a minimum, this alternative scenario would have stations at, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

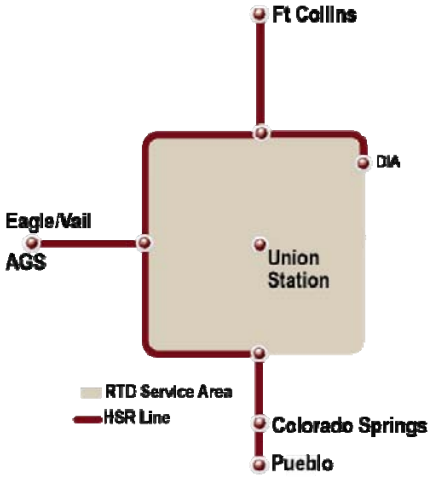
The operating strategy is to rely on the RTD transit system to provide the connections and distribution of passengers from the HSIPR located on the periphery to destinations within the Denver metropolitan area. Passengers would transfer from HSIPR to RTD at or near RTD end-of-line stations. All or nearly all trips require transfers.

EXHIBIT 4-16
Alternative Scenario B-1: Denver Periphery



Alternative Scenario B-2: Denver Periphery Excluding Southeast Quadrant

Alternative Scenario B-2
(also see Exhibit 4-17 on the following page)



Technology

Outside the Denver metropolitan area, both FRA compliant and non-compliant vehicles could be used. Inside the RTD service area, RTD technologies would be used.

Segments Considered

- **East/ West**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-4: NE Quadrant segment to get passengers to DIA.
- **North/ South**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-1: NW Quadrant and B-2: SW Quadrant segments.
- **Outside of the Denver Metropolitan Area:** Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

This alternative scenario connects to the RTD system through the construction of beltway HSIPR alternative scenarios along C-470 from I-70 to I-25 in the southwest and on E-470 from DIA to I-25 in the northeast. A new beltway segment would be constructed from I-70 to I-25 to the northwest.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 77 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 231 miles
- Total with greenfield segments = 221 miles

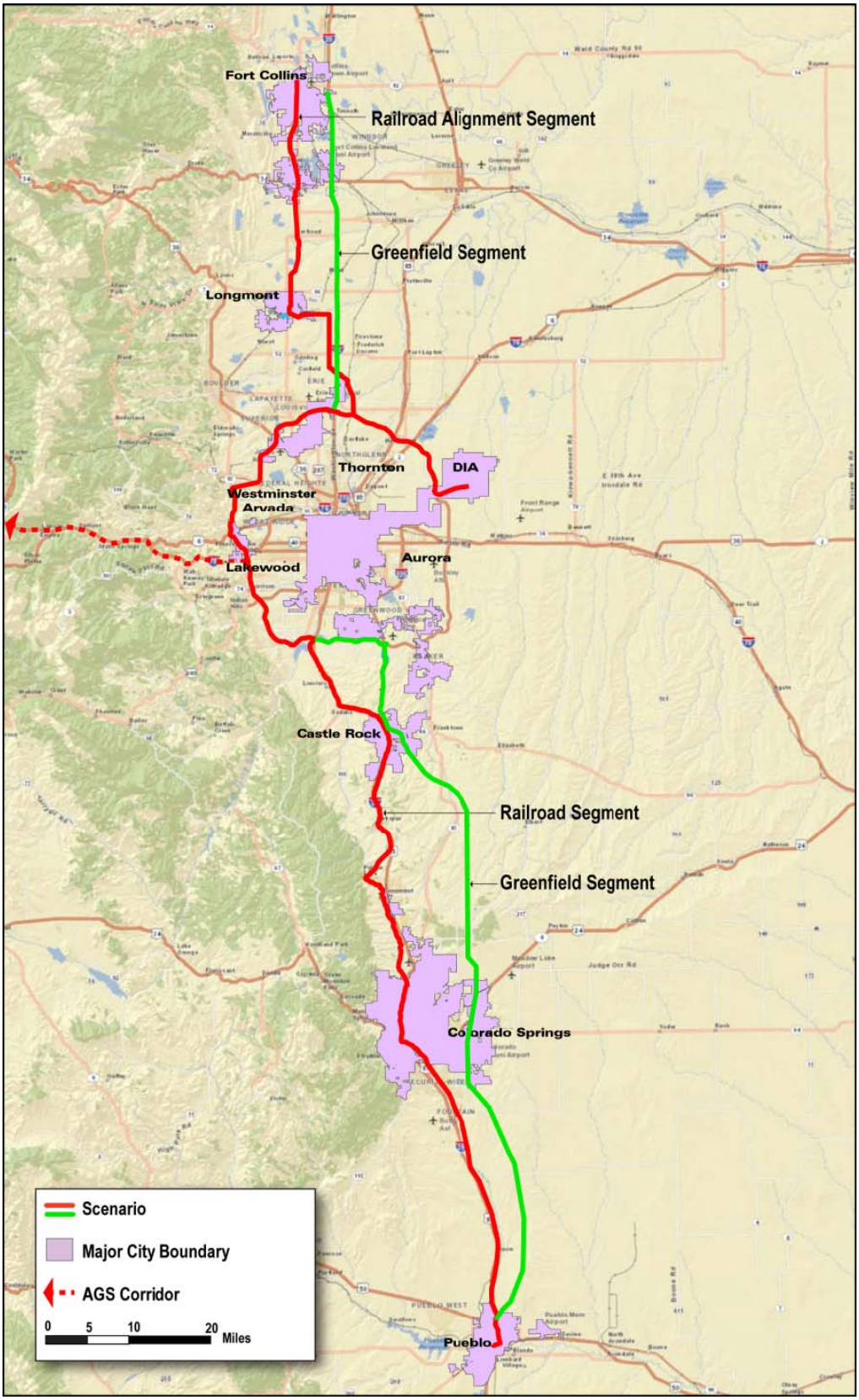
Stations

At a minimum, this alternative scenario would have stations at DIA, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

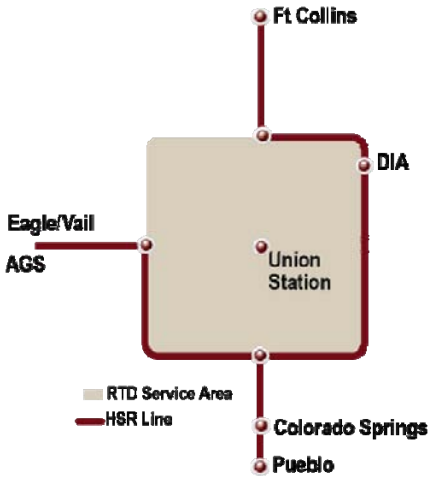
The operating strategy is to rely on RTD transit system to provide the connections and distribution of passengers from the HSIPR located on the periphery to destinations within the Denver metropolitan area. Many, but not all trips, require transfers. I-70 corridor to DIA can operate without transfers, as a one-seat ride.

EXHIBIT 4-17
Alternative Scenario B-2: Denver Periphery Excluding Southeast Quadrant



B-2A: Denver Periphery Excluding NW Quadrant

Alternative Scenario B-2A
(also see Exhibit 4-18 on the following page)



Technology

Outside of the Denver metropolitan area, both FRA compliant and non-compliant vehicles could be used. Inside the RTD service area, RTD technologies would be used.

Segments Considered

- **East/ West**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-4: NE Quadrant segment.
- **North/ South**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-2: SW Quadrant and B-3: SE Quadrant segments.
- **Outside of the Denver Metropolitan Area:** Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

This alternative scenario connects to the RTD system through the construction of a beltway of HSIPR track following C-470 south and east from the C-470/I-70 interchange to I-25. From this point, the HSIPR follows E-470 east and north to DIA, and from this point north to I-25.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 74 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 228 miles
- Total with greenfield segments = 218 miles

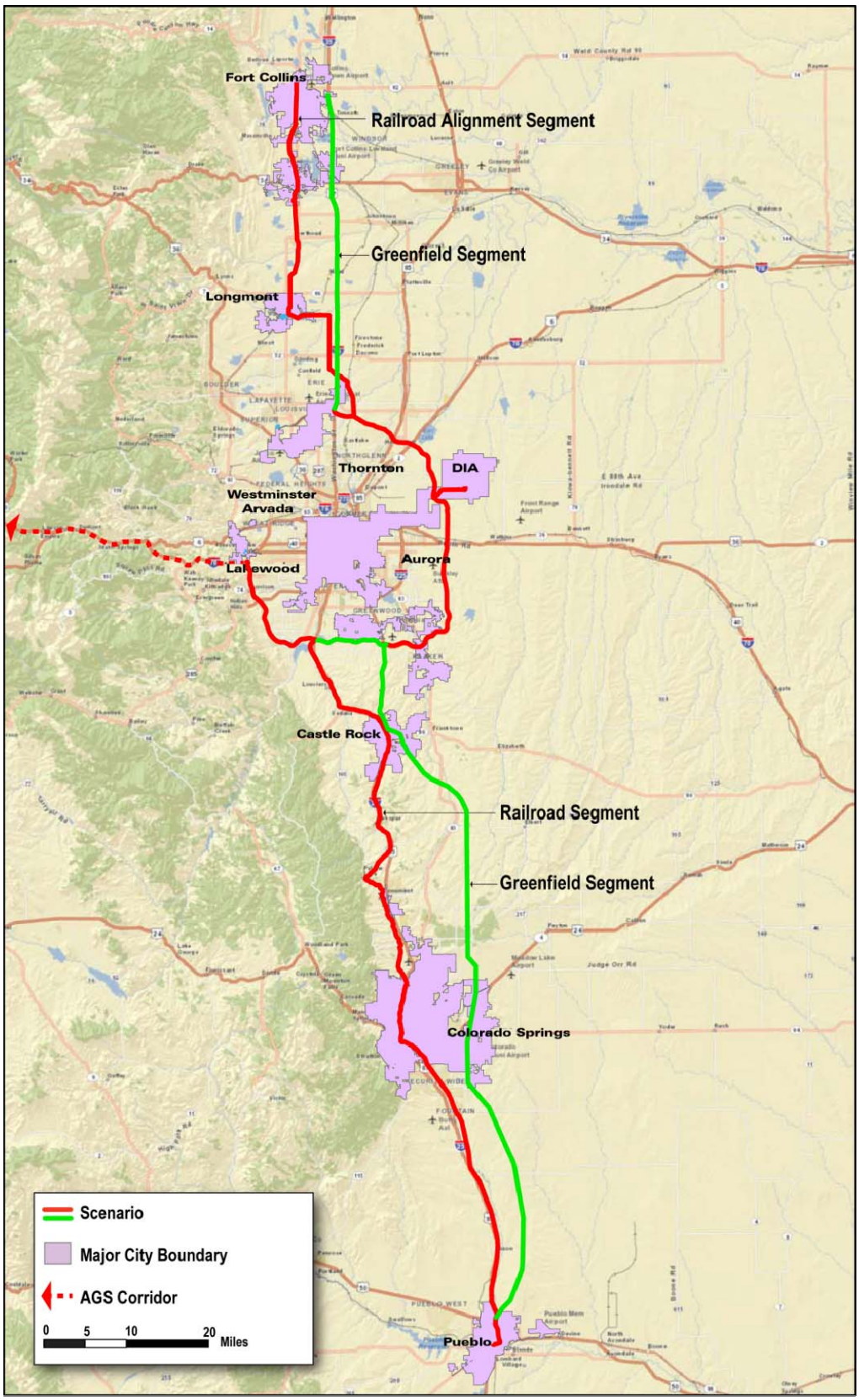
Stations

At a minimum, this alternative scenario would have stations at DIA, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

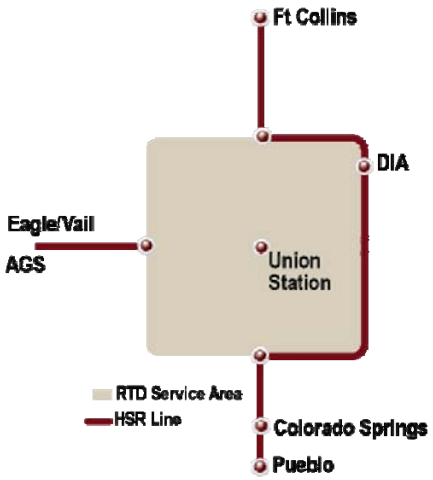
The operating strategy is to rely on the RTD transit system to provide the connections and distribution of passengers from the HSIPR located on the periphery to destinations within the Denver metropolitan area. Many, but not all trips, require transfers. I-70 corridor to DIA can operate without transfers, as a one-seat ride.

EXHIBIT 4-18
Alternative Scenario B-2A: Denver Periphery Excluding NW Quadrant



Alternative Scenario B-3: Denver Periphery Eastern Beltway

Alternative Scenario B-3
(also see Exhibit 4-19 on the following page)



Technology

Outside of the Denver metropolitan area, both FRA compliant and non-compliant vehicles could be used. Inside the RTD service area, RTD technologies would be used.

Segments Considered

- **East/ West**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-4: NE Quadrant segment.
- **North/ South**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-3: SE Quadrant segment.
- **Outside of the Denver Metropolitan Area:** Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

This alternative scenario connects to the RTD system through the construction of HSIPR following E-470 from I-25 east and south to DIA, then south on E-470 to I-25 south of Denver.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 48 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 202 miles
- Total with greenfield segments = 192 miles

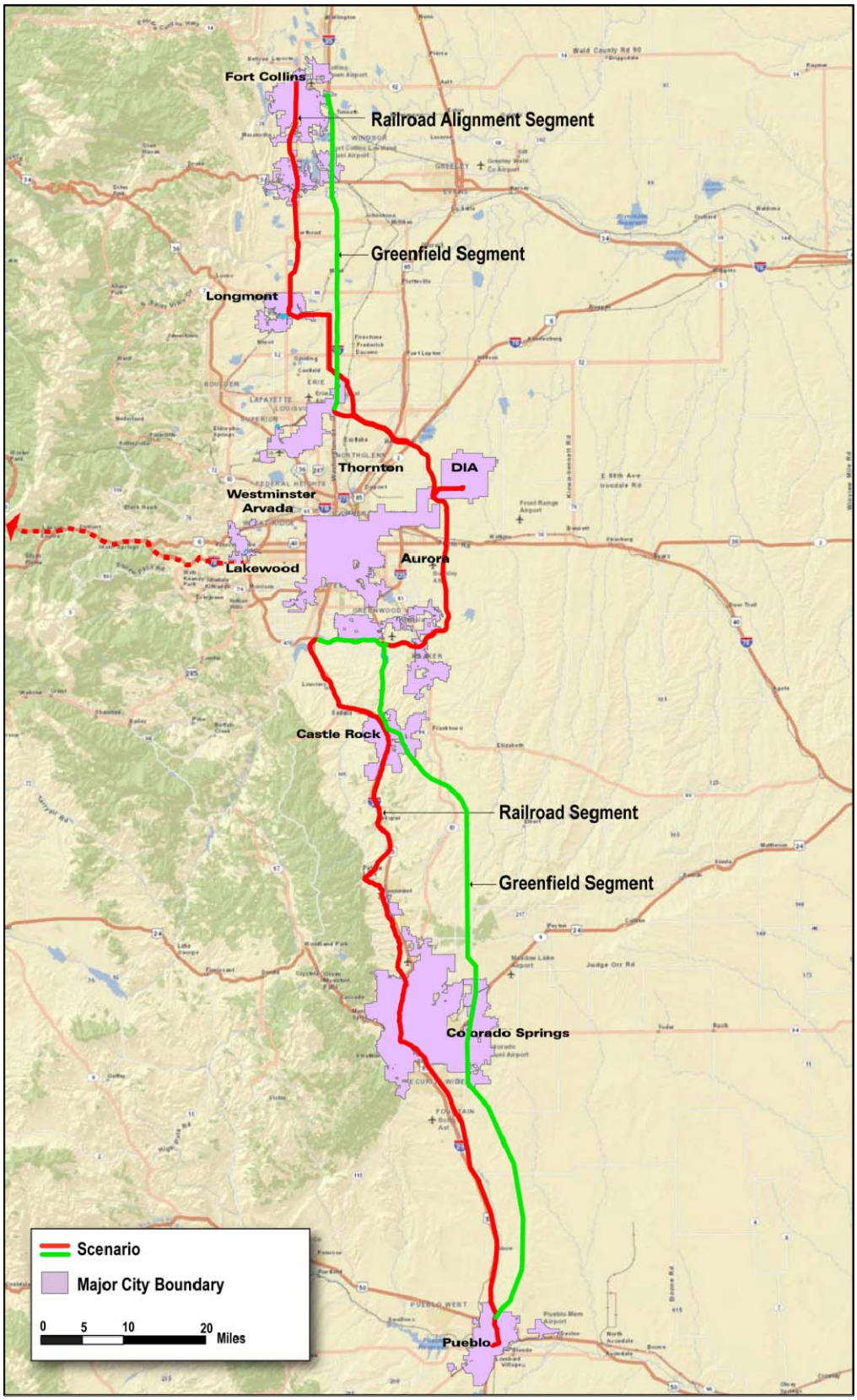
Stations

At a minimum, this alternative scenario would have stations at DIA, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

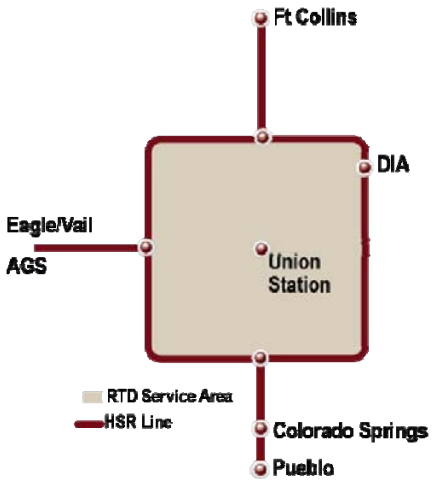
The operating strategy is to rely on RTD transit system to provide the connections and distribution of passengers from the HSIPR located on the periphery to destinations within the Denver metropolitan area. Many, but not all trips, require transfers. This configuration does not permit a one-seat ride from the I-70 corridor to DIA.

EXHIBIT 4-19
Alternative Scenario B-3: Denver Periphery Eastern Beltway



Alternative Scenario B-4: Denver Periphery Full Beltway

Alternative Scenario B-4
(also see Exhibit 4-20 on the following page)



Technology

Outside of the Denver metropolitan area, both FRA compliant and non-compliant vehicles could be used. Inside the RTD service area, RTD technologies would be used.

Segments Considered

- **East/ West**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-2: SW Quadrant and B-4: NE Quadrant segments.
- **North/ South**: Within the Denver metropolitan area, HSIPR passengers would use RTD's transit system plus the B-1: NW Quadrant, B-2: SW Quadrant, and B-3: SE Quadrant and B4: NE Quadrant.
- **Outside of the Denver Metropolitan Area:** Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation

This alternative scenario connects to the RTD system through the construction of HSIPR segments around the entire Denver metropolitan area using the E-470 and C-470 alignments. A new beltway segment would be constructed from I-70 to I-25 in the northwest quadrant.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

Length

- Denver metropolitan area = 105 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 259 miles
- Total with greenfield segments = 249 miles

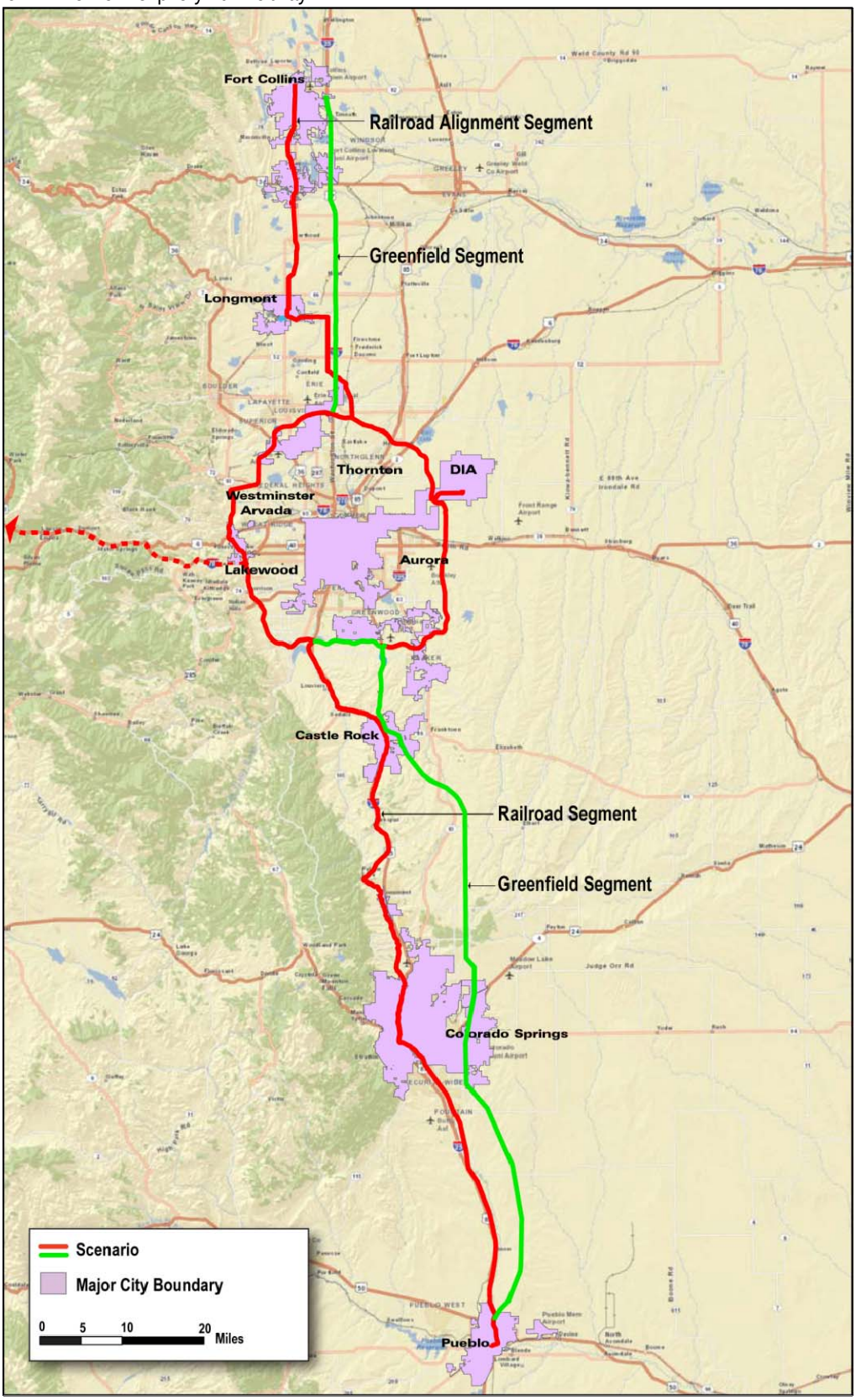
Stations

At a minimum, this alternative scenario would have stations at DIA, North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy

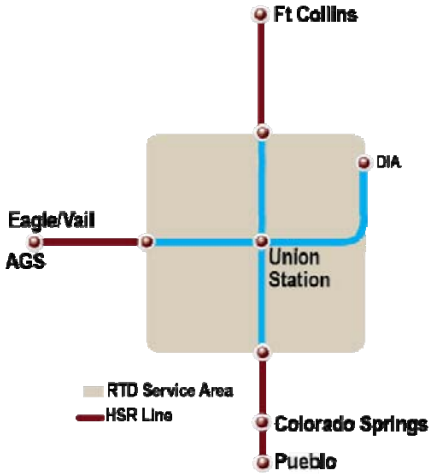
The operating strategy is to rely on RTD transit system to provide the connections and distribution of passengers from the HSIPR located on the periphery to destinations within the Denver metropolitan area. Many, but not all trips, require transfers. I-70 corridor to DIA can operate without transfers, as a one-seat ride.

EXHIBIT 4-20
Alternative Scenario B-4: Denver Periphery Full Beltway



Alternative Scenario C-1: Shared Track with RTD

Alternative Scenario C-1
(also see Exhibit 4-21 on the following page)



Technology
This alternative scenario would require FRA-compliant technologies.

Segments Considered
East/ West: Shared use of RTD's EAGLE Rail tracks from DIA to Ward Road in Arvada.

North/ South: Shared use of RTD's future North Metro Commuter Rail tracks to DUS. HSIPR could not share RTD's southeast and southwest corridor tracks due to the differences in technology. So this means one of three things: (1) use of joint line south of DUS, (2) transfer to SE or SW line, or (3) use of SE portion of E-470 to access RTD's East Corridor. This segment will be re-engineered in Level 2 Evaluation.

Outside of the Denver Metropolitan Area: Northern segments are N-1 or N-2, and southern segments are S-1 or S-2. This configuration is consistent for all A-, B-, and C-series HSIPR alternative scenarios.

Segment Combinations to be Evaluated in Level 2 Evaluation
This alternative scenario assumes that HSIPR will use an operating window on the existing East Line and Gold Line Commuter Rail projects and the future North Metro Commuter Rail project. FRA-compliant technology would be required. Because RTD operates light rail vehicles on both the southwest and southeast corridors, FRA-compliant technology could not be used. Some improvements to signal systems might be required to make this alternative scenario function.

Outside of the Denver metropolitan area, the HSIPR would continue on either a railroad (N-1, S-1) or a greenfield (N-2, S-2) segment.

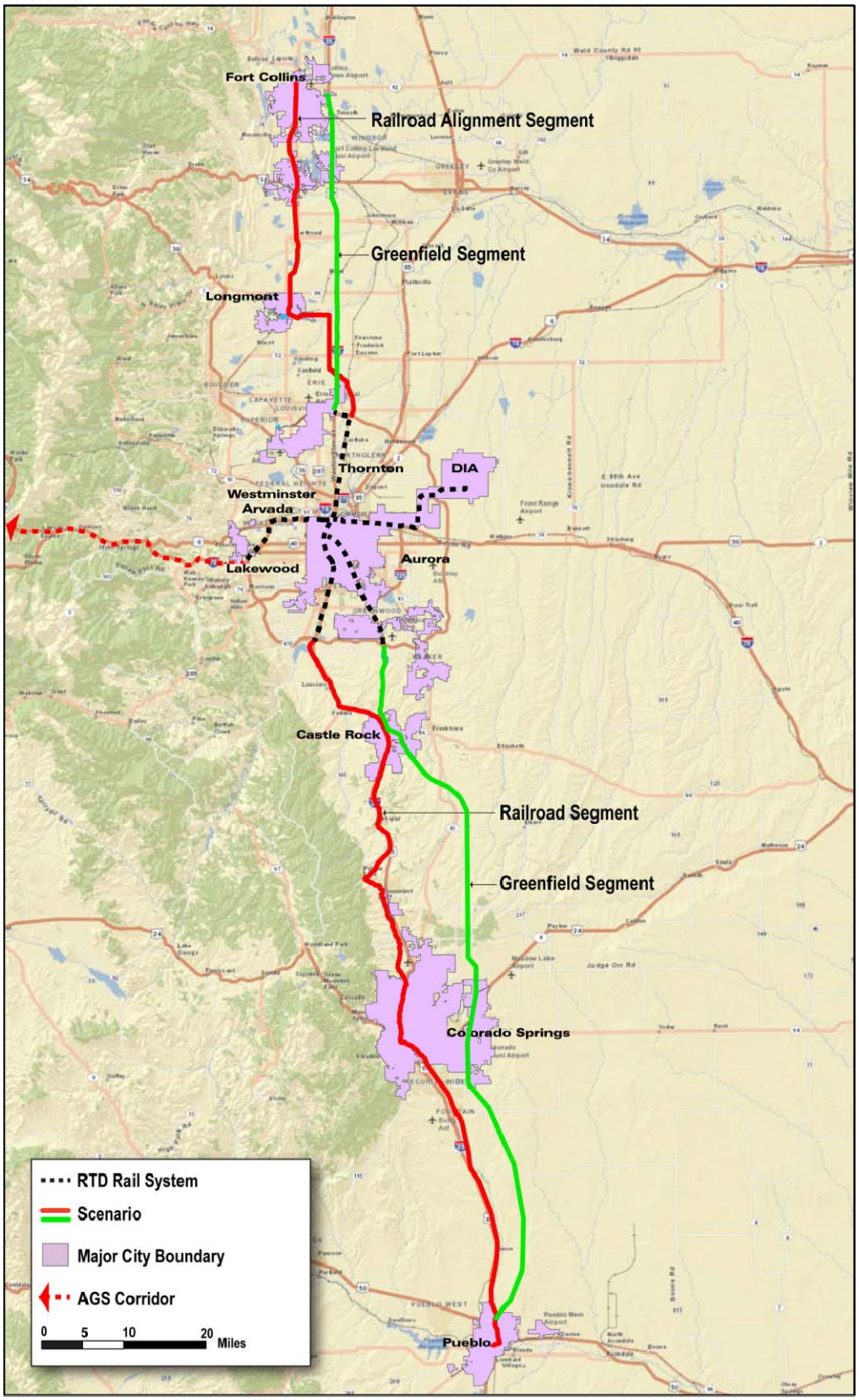
Length
- Denver metropolitan area = 0 miles
- Railroad alignments outside Denver metropolitan area = 154 miles
- Greenfield segments outside Denver metropolitan area = 144 miles
- Total with railroad alignments = 154 miles
- Total with greenfield segments = 144 miles

Stations
At a minimum, this alternative scenario would have stations at North Metro, South Metro, West Metro, Colorado Springs, Pueblo, and Fort Collins.

Operating Strategy
The operating strategy is for HSIPR to share track with RTD's Eagle project (East Rail and Gold Line) and the RTD North Metro Corridor. This would require negotiation of an operating window between the HSIPR Authority and RTD and the use of FRA-compliant technologies since both systems operate within freight rail corridors.

HSIPR could not operate on either the SW or SE corridors since both systems use LRT which is not FRA compliant. FRA compliant and non-FRA compliant technologies cannot be operated on the same track.

EXHIBIT 4-21
Alternative Scenario C-1: Shared Track with RTD



Section 5: Evaluation of Segments and HSIPR Alternative Scenarios

This section discusses how the individual segments and the composite HSIPR alternative scenarios were evaluated and the results of this evaluation. The Level 1 Evaluation concludes with several of the segments being placed aside from further consideration due to anticipated poor efficiency for HSIPR and/or high community impacts. However, it has also been found that some of the segments that are anticipated to perform effectively for HSIPR also can be expected to cause high community impacts, require extensive ROW acquisition, and be costly to construct. Many of the segments that fall into this latter category are retained for Level 2 ridership modeling studies to provide a baseline from which to judge segments that have fewer impacts but are likely to generate lower HSIPR ridership. Detailed cost estimates in Level 2 Evaluation will also help determine the future disposition of these segments.

How Level 1 Segments and Alternative Scenarios Were Evaluated

Six evaluation criteria were developed to provide a qualitative review of the Level 1 segments and alternative scenarios. The intent was to evaluate the segments of a possible alternative scenario such as four possible routings from the C-470/I-70 interchange in Jefferson County to Central Denver, then combine the best performing segments into alternative scenarios.

In this Level 1 Evaluation, the majority of the measures were qualitative and based on Google Earth evaluation, conclusions from past studies, and wind shield surveys to better understand the physical challenges facing each segment. Comparisons or trade-offs between segments were also evaluated. Both the segments and the resulting alternative scenarios were evaluated using the same six general criteria, which included:

- **Fulfillment of the Purpose and Need -** Each segment was evaluated for its ability to meet the general intent of the Purpose and Need of the study. Because no quantitative data exists for costs, impacts, or ridership, only general conclusions could be drawn. For example, those segments that follow railroad alignments generally do not support the speed characteristics of HSIPR and thus scored lower than the straighter, faster greenfield segments.
- **Transportation and Mobility** – This criterion included qualitative measures, such as the opportunity for a "one-seat" ride, which has been articulated as a high priority for the I-70 Mountain Corridor stakeholders. Other measures included travel time measured as faster than RTD inside the Denver metropolitan area and faster than an automobile outside of cities; ability to meet FRA's criteria for Emerging HSIPR (90 to 110 mph); and population served. This latter measure proved less valuable because all of the greenfield alternatives were assumed to include the same station locations. Conversely, the railroad alignments typically are anticipated to operate slower, run through urban areas and have been specified to include more stops based on the recommendations of earlier studies.
- **Other Public Benefits** – This criterion included the potential for environmental and community impacts based on general population density or the known presence of important environmental features. Public safety also was measured based on the number of at-grade crossings represented by a segment.
- **Engineering Feasibility** – This criterion included the judgment call that a segment represented the potential for high construction costs due to the quantity of elevated structure, general lack of ROW, and need for interface with the freight railroads and difficult

topography. The potential for conflicts with the freight railroads were also considered.

- **Ability to Accommodate a Range of Technologies –** The I-70 Mountain Corridor stakeholders are concerned that the availability of technologies not be limited to those that are FRA compliant. There is a belief that non-FRA compliant technologies may be lighter and thus more accommodating to the requirements of the mountain environment. The ability to have a HSIPR technology that is common to a state-wide system is also considered important.
- **Degree of Community Support** – This criterion is both a quantitative count of public comments and a qualitative assessment of public opinion based on results of the PLT and public open houses conducted during Level 1 Evaluation. The different technologies and alternative scenarios result in varying impacts on community resources and residences and, therefore, varying levels of community-based support for implementation. Section 6 summarizes the input received at the public open houses held in Denver, Fort Collins, Colorado Springs, and Pueblo.

Evaluation of Technologies

At this point in the study, no transit technologies have been eliminated. The intent of the ICS is to find alternative scenarios that allow a full range of technologies, with a minimum speed of 90 to 100 mph possible on some portions of the alignment. The lower speed capabilities will be characteristic of the segments that follow railroad alignments. The greenfield segments will be configured for speeds up to and even beyond 200 mph.

The I-70 Mountain Corridor stakeholders have a strong preference for Advanced Guideway System (AGS) technologies that can be elevated, travel at least as fast as an automobile, are quiet, and are possibly lighter than conventional train-sets. The alternative scenarios have been conceived to allow these technologies in most instances. Segments within the railroad corridors must use FRA-compliant technologies, ruling out equipment that does not meet these criteria. All of the greenfield segments would allow both FRA-compliant as well as non-compliant technologies. The categories of technologies that will be brought into the Level 2 Evaluation are listed in **Exhibit 5-1**.

EXHIBIT 5-1
Technology Categories

Technology	Description
Locomotive Hauled Coach	
	Steel wheel on steel rail, FRA-compliant, diesel powered equipment, limited in speed to 110 mph, with railcar tilting capability around curves. Suitable for use on existing rail corridors, including with shared track.
Electric Multiple Unit (EMU)	
	Steel wheel on steel rail, FRA-compliant, electrified equipment, with tilting capability. Suitable for use on dedicated track at speeds from 150 to 220 mph in new, fully grade-separated corridors. In urban conditions where ROW is constrained, the system may share the ROW but not track with freight and operate at restricted speeds.
Urban Magnetic Levitation with Linear Induction Motor (LIM) Technology	
	Best represented by Japanese high-speed surface transport (HSST) trains, with speeds up to 125 mph. The system may be constructed in new fully grade-separated corridors, and avoids the use of freight railroad ROW where possible.
High-speed Magnetic Levitation with Linear Synchronous Motor (LSM) Technology	
	Best represented by the German TransRapid system and Shanghai system, with speeds from 250 to 300 mph. The system would be constructed in new fully grade-separated corridors and avoid the use of freight railroad ROW where possible.
Developing Technologies	
	Emerging innovative systems with speeds over 110 mph that might be available by 2017 to dovetail with the timeline requirements of the AGS project. .

Evaluation of Segments

As described earlier, the individual segments are the building blocks for the HSIPR alternative scenarios. The segments evaluated were grouped into three categories:

- Denver Metropolitan Area Segments
- Beltway Segments
- Outside Denver Segments

The evaluation of these segments is provided in a series of summary matrices in this section, with more detailed matrices provided in **Appendix A**.

Denver Metropolitan Area Segments

I-70/C-470 to Central Denver Segments

Four segments were evaluated for entering central Denver from the west:

- W-1: US 6/Gold Line/DUS
- W-2: I-70/I-76/DUS
- W-3: I-70/New Stockyard Station
- W-4: I-70/US 6/DUS

As described below, each of these four segments presents constructability challenges due to limited ROW and the potential for high community impacts.

W-1: US 6/Gold Line/DUS (21.6 miles)

W-1 presents many challenges to implementing HSIPR. First, at 21.6 miles, it is the longest West segment evaluated. Its path is also less effective, or more out-of-direction than other W-series segments. It would require the construction of a HSIPR connection from the RTD Gold Line end of line (EOL) at Ward Road to the vicinity of the RTD West Corridor EOL just west of C-470/I-70. RTD owns the ROW from Ward Road to the Coors Brewery in Golden. New ROW would need to be acquired along US 6 to I-70. The photograph to the right (top) shows a cemetery that would likely be affected by HSIPR construction near Ward Road traveling west along the BNSF corridor.

Secondly, unless the existing RTD track is shared with the HSIPR, new ROW would need to be acquired parallel to the Gold Line Communter Rail. This would require the acquisition of one row of parcels from Ward Road to Pecos Street, with many impacts to the communities of Wheat Ridge, Arvada, Adams County, and Denver.

Many residences in Wheat Ridge and Arvada would need to be relocated. Four historic districts in Arvada would be affected, and Olde Town Arvada would be heavily impacted. Lastly, there is no known solution to access DUS from Utah Junction as the entire freight corridor is committed or over committed in 2035, according to CDOT's State Rail Plan.

Recommendation: This segment should be dropped from further consideration except when used in HSIPR Alternative Scenario C-1, which shares track with the Gold Line Commuter Rail.

W-2: I-70/I-76/DUS (18.5 miles)

Construction of HSIPR along I-70 will require use of aerial structure in many cases. Some sections of CDOT ROW are available from C-470/I-70 to Wadsworth Boulevard on I-70. As shown in the photograph below, much of I-70 includes a center median; other portions of the segment are much more confined.

At the transition to I-76, ROW is available in the median in many areas but is likely being reserved for future highway expansion. Areas of difficult topography are fairly common outside of the median, reducing constructability. Similar to W-1,

access to DUS from Utah Junction is very difficult, if not impossible, given the current freight track use and configuration. Segment W-2 is longer than W-3 and W-4 with no apparent benefits over these other segments.

Recommendation: This segment should be dropped from further consideration because there is no ROW available for HSIPR from Utah Junction to DUS.

W-3: I-70/New Stockyard Station (16.5 miles)

As mentioned for segment W-2, I-70 into Denver has some ROW for HSIPR west of the Wadsworth/I-70 interchange, where the highway transitions from 8 to 6 lanes. East of Wadsworth Boulevard to Pecos Street, the highway is constrained by residential land uses and parks. It is assumed that the HSIPR would be elevated over I-70 on straddle bents east of Wadsworth Boulevard, resulting in very high costs and difficult visual impacts. Further, a HSIPR flyover of I-25 would also be difficult and costly. The acceptability of placing a HSIPR station in the vicinity of the Stockyards is unknown, but ROW acquisition is anticipated to be very difficult. However, a location for a station near the Stockyards has the advantage of avoiding the cumbersome reverse movement required to access DUS.

It should be noted that during the Denver to Golden Major Investment Study (MIS), the public was highly resistant to widening I-70 in this area for either highway or light rail.

Recommendation: Despite the challenges, this segment should be retained for ridership modeling in the Level 2 Evaluation. Segment W-3 presents one of several difficult choices for developing a direct and comparatively fast one-seat ride to DIA from the I-70 mountain communities. It will also test the ridership impact of a central Denver station that is different from DUS.

W-4: I-70/US 6/DUS (13.3 miles)

This segment is the shortest and possibly the fastest of the four West segments evaluated for the entry into Denver from the mountains. However, the ROW for the HSIPR would need to be acquired by obtaining one row of generally residential parcels for almost the entirety of the segment, as shown in the photograph below.

Additionally, much of the US 6 segment is being used for portions of RTD's West Corridor. The HSIPR would need to fly over or tunnel under several LRT aerial structures, including a signature bridge, shown below.

Segment W-4 would also require a complicated flyover of I-25 to merge with the Consolidated Main Line (CML). Once on the CML, it is assumed that the HSIPR would be elevated over the freight track, or alternatively, the ROW for the segment would be acquired parallel to the freight rail. The stop at DUS would be located adjacent to the LRT station, allowing a direct pass-through of the HSIPR station. The impacts of this segment are anticipated to be at least as high as those for segments W-1 and W-3.

Recommendation: Despite the challenges, this segment should be retained for ridership modeling in the Level 2 Evaluation. This segment provides a design option to W-3 above; it will also allow a comparison of the ridership generated by a HSIPR stop at DUS versus a new Stockyards station.

Exhibit 5-2 summarizes the Level 1 Evaluation of the West segments.

EXHIBIT 5-2
Summary of Comparative Scoring of I-70/C-470 to Central Denver Segments – Level 1 Evaluation

Segment		Meets Purpose & Need	One-seat Ride	Faster than RTD in Metro Area	Faster than Auto (Outside Metro Area)	Meets FRA Criteria for Emerging HSIPR Corridor (90 to 100 mph)	Population/Activity Centers Served	Potential for Environmental Impact	Safety	Probable High Cost	Property Acquisition	Freight Conflicts	Does not Limit Technology Choice	Recommendation for Modelling	Comments
W-1: US 6/Gold Line/DUS		−	+	+	NA	−	=	−	=	−	−	=	−	−	▪ Public acceptance not likely ▪ Inefficient alignment in BNSF/Gold Line corridor ▪ Significant community impacts ▪ Limited capacity in existing corridors ▪ High costs due to structures and new ROW ▪ Limited to FRA-compliant technology
W-2: I-70/I-76/DUS		−	+	+	NA	−	=	−	+	−	−	−	−	−	▪ Public acceptance not likely ▪ Limited segment flexibility ▪ High costs due to structures ▪ Limited to FRA-compliant technology
W-3: I-70/New Stockyard Station		=	+	+	NA	−	=	−	+	−	−	+	+	+	▪ Public acceptance not likely ▪ Avoids reverse move at DUS ▪ Supplemental EIS likely for I-70 East EIS ▪ Significant community impacts ▪ New HSIPR station requires ROW ▪ High costs due to structures and new ROW ▪ Allows both FRA-compliant and non-FRA-compliant technology
W-4: US 6 /CML/DUS		=	+	+	NA	−	+	+	+	−	−	−	−	+	▪ Public acceptance not likely ▪ Shortest of the West segments ▪ Significant community impacts ▪ High costs due to structures and new ROW ▪ Limited to FRA-compliant technology ▪ High potential for freight conflicts

LEGEND
+ = Favorable (Likely to have positive impacts, i.e. benefits)
− = Challenging (Likely to have significant negative impacts)
= = Neutral (Likely to have neutral impacts, or mixed positive and negative impacts)

Central Denver to DIA

Four segments were evaluated for travelling from central Denver to:

- E-1: DUS/CML/I-70/East Corridor/DIA
- E-2: DUS/CML/I-70/Pena/DIA
- E-3: New Stockyard Station/I-70/Pena/ DIA
- E-4: DUS/CML/96th Avenue/DIA

As discussed below, each of the four segments presents considerable constructability issues due to limited ROW availability and the presence of environmental justice communities between I-25 and Colorado Boulevard.

E-1: DUS/CML/I-70/East Corridor/DIA (23.6 miles)

Segment E-1 presents the challenges of locating sufficient ROW in the over-capacity CML and gaining acceptance for inclusion in the cut-and-cover tunnel being proposed to replace a portion of the I-70 viaduct. Obtaining a Preferred Alternative on I-70 has been difficult for CDOT's I-70 East EIS; inclusion of a HSIPR in the tunnel and trench has not been part of the project and would require supplemental environmental work to accomplish. The public acceptance of widening the trench another 34 feet is unknown. Conversely, because I-70 will be under construction, inclusion of HSIPR during this disturbed state would mitigate the impacts to the corridor.

East of Colorado Boulevard, E-1 merges with the existing RTD East Rail in the UPRR ROW. There is no UPRR ROW available for HSIPR, so this segment would require acquisition of new parallel ROW from Colorado Boulevard east to Pena Boulevard. It is assumed that the ROW would be acquired south of Smith Road. The affected property is all industrial. While community impacts are not anticipated to be troublesome east of Colorado Boulevard, the cost of property acquisition could be great. The amount of aerial structure is also anticipated to be great. Access over the proposed Peoria Street grade-separation project is expected to cause difficult challenges for construction.

Recommendation: This segment should be dropped from further consideration. The impacts of E-1 are anticipated to be comparable to those of E-2, which is slightly preferred. The ridership benefit of either segment should be comparable.

E-2: DUS/CML/I-70/Pena/DIA (22.6 miles)

The impacts of E-2 are analogous to E-1 up to Colorado Boulevard. However, there appears to be some public ROW along I-70 to Pena Boulevard. The availability of CDOT ROW will depend on the ultimate highway cross-section recommended in the ongoing I-70 East EIS. This option would avoid the challenges of crossing over the proposed Peoria Street grade-separation project discussed for E-1.

Recommendation: This segment should be retained for further consideration as it will be required to test the impacts of providing a station at DUS. E-2 will be combined with W-4 to access DIA.

E-3: New Stockyard Station/I-70/Pena/DIA (20.1 miles)

As discussed for Segment W-3, this segment continues east from a flyover of I-25 and will travel near probable environmental justice neighborhoods located south of 48th Avenue and east of I-25. It will also involve a flyover of the CML prior to merging into the I-70 ROW near Brighton Boulevard. From this point east, the segment is the same as described for E-2.

Recommendation: This segment should be retained for further consideration as it will be required to test the impacts of providing a station in the vicinity of the Stockyards. Segment E-3 would likely be combined with Segment W-3 to access DIA.

E-4: DUS/CML/96th Avenue/DIA (24.3 miles)

This segment avoids the impacts associated with RTD's East Rail or the I-70 ROW. However, according to the State Rail Plan, the CML to 96th Street is over-capacity, and it is assumed that railroad ROW would likely not be available. Based on this assumption, it is possible that elevated structure would be required from DUS to 96th Street. (However, at the time of the writing of this report, field work suggests that an

adequate envelope for a HSIPR track would be available.)

Constructability issues are also anticipated near Sand Creek where the UPRR and BNSF rail lines cross under I-270, as shown in the photograph below. The HSIPR would be required to fly over I-270 and the two rail lines.

Paralleling 96th Street to DIA appears to be promising, as there is a 100-foot-plus buffer between the Rocky Mountain Arsenal and 96th Avenue. Residential property is located along the north side of 96th Avenue, as shown in the photograph below, so noise impacts may be a concern.

The potential HSIPR alignment is to the south side of the roadway. East of E-470, the character of the landscape is dryland farming, with no community impacts and few environmental impacts anticipated.

Recommendation: This segment should be retained for further consideration as a possible component of one of the HSIPR alternative scenarios, as it appears that sufficient ROW is available to accommodate a HSIPR along most sections of the segment. The apparent availability of ROW is in direct conflict with the findings of the State Rail Plan.

Exhibit 5-3 summarizes the Level 1 Evaluation of the East segments.

EXHIBIT 5-3
Summary of Comparative Scoring of Central Denver to DIA Segments – Level 1 Evaluation

		Meets Purpose & Need	One-seat Ride	Faster than RTD in Metro Area	Faster than Auto (Outside Metro Area)	Meets FRA Criteria for Emerging HSIPR Corridor (90 to 100 mph)	Population/Activity Centers Served	Potential for Environmental Impact	Safety	Probable High Cost	Property Acquisition	Freight Conflicts	Does not Limit Technology Choice	Recommendation for Modelling	Comments
E-1: DUS on CML to I-70 to East Corridor at Colorado Blvd to DIA		–	+	+	NA	–	+	–	+	–	–	–	=	–	▪ Public acceptance not likely ▪ Insufficient ROW in CML corridor ▪ Significant community impacts ▪ Possible Supplemental NEPA document (I-70 East EIS) ▪ No capacity on the CML ▪ High costs due to structures and new ROW ▪ Technology likely limited to FRA-compliant
E-2: DUS on CML to I-70 to Pena Blvd to DIA		=	+	+	NA	–	+	–	+	–	–	–	=	+	▪ Public acceptance not likely ▪ Same CML capacity issues as E-1 ▪ Public ROW possible via I-70 ▪ Significant community impacts ▪ Potential Supplemental NEPA document (I-70 East EIS) ▪ High costs due to structures and new ROW
E-3: New Stockyard Station to I-70 to Pena to DIA		=	+	+	NA	–	=	–	+	–	–	+	+	+	▪ Public acceptance not likely ▪ Avoids impacts along CML ▪ Impacts to Stockyards and station area ▪ Likely allows both FRA-compliant and non-FRA-compliant technologies
E-4: DUS on CML to Brush Line to 96th Ave. to DIA		=	+	+	NA	–	+	+	+	=	=	–	–	+	▪ ROW appears to be available along much of the segment ▪ Potential isolated community impacts ▪ High costs due to elevated structures along the CML/Brush Line

LEGEND
+ = Favorable (Likely to have positive impacts, i.e., benefits)
– = Challenging (Likely to have significant negative impacts)
= = Neutral (Likely to have neutral impacts, or mixed positive and negative impacts)

North/South Railroad Alignments

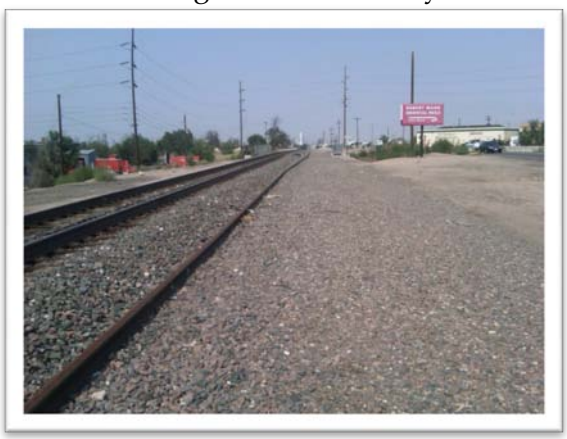
The existing railroad alignment through the Denver metropolitan area is considered the most practical north/ south segment for HSIPR implementation. It has been subdivided into two shorter segments:

- NS-1: Consolidated Main Line (CML)
- NS-2 CML and Joint Line

As discussed below, both segments present challenges for the implementation of HSIPR.

NS-1: Consolidated Main Line (24.7 miles)

The CML extends from Sand Creek Junction north of Denver to approximately where the rail line crosses I-25 near RTD's Broadway Station. The RMRA High-Speed Rail Feasibility Study assumed that much of the freight traffic would be diverted east of the metropolitan area via the proposed Rail Relocation for Colorado Communties (R2C2) by-pass project. However, this project has been placed on indefinite hold, with the result that no capacity on the freight corridor will be available for HSIPR. Additionally, much of the freight traffic on the CML is for the service of local customers, offsetting the effectiveness of the R2C2 program. And lastly, the State Rail Plan indicates that the CML will be over-capacity in 2035, suggesting that acquisition of new ROW is likely. This projection needs to be validated as field work indicates that space may be available parallel to the railroad ROW. The photograph below was taken just north of the I-70 viaduct, and the photograph to the top right is along US 85 south of 96th Avenue with the freight alignment located to the right of the roadway.



Despite visual observations, it is assumed that any HSIPR use of the CML corridor would require either aerial structure over the freight track or the acquisition of new ROW parallel to the corridor. The use of aerial structure would result in visual impacts though the metropolitan area and would still require some level of ROW acquisition. Acquiring new ROW paralleling the CML would have troublesome community impacts. Travel speeds would likely be slower than desired for HSIPR due to the curvature of the freight lines. Heavy freight traffic on this segment also increases the opportunity for freight conflicts, especially during construction.

The use of NS-1 segment would limit options to FRA-compliant technology.

Recommendation: This segment should be retained for Level 2 modeling as it is the only North–South segment accessing DUS. The performance of this segment will need to be contrasted to one of the beltway segments.

NS-2 CML and Joint Line (14.5 miles)

This segment follows the CML to the point where it merges with the Joint Line, where I-25 crosses the rail corridor south of Denver near RTD's I-25 and Broadway LRT station and continues on the Joint Line adjacent to Santa Fe Drive to the C-470/Santa Fe Drive interchange in Littleton. The Joint Line segment between Denver and Littleton is also constrained by limited ROW and capacity issues, including the operation of the existing RTD Southwest Line LRT.

As shown in the photograph below, two vacant tracks in this segment are dedicated to RTD LRT.

The placement of HSIPR in this corridor presents some of the same problems described for segment NS-1. The HSIPR would need to be elevated over the Joint Line in most locations, or a new ROW paralleling the corridor would be required. For example, the HSIPR could not be constructed in the existing Littleton trench, shown in the photograph below, which contains both freight track and RTD's Southwest corridor, due to a lack of space.

Travel speeds are also assumed to be lower than desired for HSIPR. Heavy freight traffic on this segment also increases the opportunity for freight conflicts, especially during construction.

The use of NS-2 would limit technology options to those that are FRA-compliant.

Recommendation: This segment should be retained for Level 2 modeling as it is the only North/South segment accessing DUS from the south. The performance of this segment will need to be contrasted to one of the beltway segments.

Exhibit 5-4 summarizes the Level 1 Evaluation of the North-South segments.

EXHIBIT 5-4
Summary of Comparative Scoring of North-South Segments through Denver – Level 1 Evaluation

Segment		Meets Purpose & Need	One-seat Ride	Faster than RTD in Metro Area	Faster than Auto (Outside Metro Area)	Meets FRA Criteria for Emerging HSIPR Corridor (90 to 100 mph)	Population/Activity Centers Served	Potential for Environmental Impact	Safety	Probable High Cost	Property Acquisition	Freight Conflicts	Does not Limit Technology Choice	Recommendation for Modelling	Comments
NS-1: CML		=	+	+	NA	–	+	–	=	–	–	–	+	+	▪ Public acceptance not likely ▪ Could be a one-seat ride and faster than RTD ▪ Insufficient curvature ▪ No capacity on the CML according to the State Rail Plan. ▪ High costs due to elevated structure ▪ Serves central Denver ▪ Significant community impact
NS-2: CML/ Joint Line		=	+	+	NA	–	+	–	=	–	–	–	+	+	▪ Same conditions as NS-1 ▪ HSIPR through Littleton would be problematic and need new ROW

LEGEND
+ = Favorable (Likely to have positive impacts, i.e. benefits)
– = Challenging (Likely to have significant negative impacts)
= = Neutral (Likely to have neutral impacts, or mixed positive and negative impacts)

Beltway Segments

Four beltway segments were evaluated to allow the HSIPR to circumvent the impacts associated with passing through the Denver metropolitan area:

- Northwest Quadrant
- Southwest Quadrant
- Southeast Quadrant
- Northeast Quadrant

As described below, all four of the segments are believed to provide mostly at-grade construction with comparatively reduced impacts. The E-470 highway corridor includes dedicated ROW for rail transit. Public ROW is also anticipated to be available along C-470. It is anticipated that the HSIPR would be largely contained within the highway ROW in these segments. However, the NW Quadrant would require the acquisition of all new private ROW.

B-1: Northwest Quadrant (31 miles)

As stated above, the Northwest Quadrant would require the acquisition of all new ROW. Local stakeholders have strongly resisted previous attempts to extend the highway through this final leg of the beltway surrounding the Denver metropolitan area. The environmental conditions are unknown. However, the HSIPR would traverse undeveloped land and is expected to result in greater controversy than would construction in any of the other three segments in the quadrants that use public ROW. There may, however, be greater support for a passenger rail facility in this location as compared to a highway facility. Travel speeds in the Northwest Quadrant could approach 80 mph or more. Because there are few roads in the area, there would be minimal grade separations. Impacts to communities would be low due to the general absence of development. Impacts to the natural environment are expected to be higher than in the three disturbed beltway segments.

Recommendation: This segment should be set aside in favor or other segments due to the potential for controversy.

B-2: Southwest Quadrant (26 miles)

The geometry and topographic characteristics of this segment would allow speeds of 80-plus mph. Community impacts are expected to be low, as are impacts to the natural environment. Construction in this segment would involve flying over 14 major highway structures, increasing the cost of the HSIPR. The remaining construction could occur at grade as shown in the photograph below.

Difficult constructability issues are anticipated near the C-470/Santa Fe interchange where a fourth- or fifth-level structure, or tunnel, would be required. Careful planning would also be required to avoid impacts to Chatfield State Park. The photograph below shows park property at the edge of ROW.

While the area is developing the travel markets are less robust than in the Southeast Quadrant.

Recommendation: This segment should be retained for further consideration as it will be necessary to test the cost-effectiveness of a

beltway alignment around the Denver metropolitan area.

B-3: Southeast Quadrant (28 miles)

Similar to the other beltway segments, the geometry and topographic characteristics of B-3 would allow speeds of 80-plus mph. Also similar to B-2, this segment would require grade separation of 14 highway structures. However, as shown in the photographs below, construction conditions are fairly unconstrained, allowing the installation of at-grade track. Environmental impacts are also anticipated to be negligible compared to the segments through Denver.

As mentioned earlier, the E-470 Toll Authority has allotted available ROW for future transit, further offsetting the complications of property acquisition in this segment.

This segment would provide service to the "Denver Tech Center" area which is the region's second largest employment center. Even considering the developed nature of much of this corridor, impacts to communities are anticipated to be negligible. Likewise, impacts to the natural environment are expected to be minimal.

Recommendation: This segment should be retained for further consideration as it will be necessary to test the cost-effectiveness of a beltway alignment around the Denver metropolitan area.

B-4: Northeast Quadrant (20 miles)

Similar to the other beltway segments, the geometry and topographic characteristics of B-4 would allow speeds of 80-plus mph. The HSIPR would need to be grade-separated from six highway structures, resulting in per mile construction costs that would be somewhat less than the B-2 and B-3 segments. Again, the availability of dedicated E-470 ROW and open construction conditions in this segment, shown in the photograph below, would result in limited community impacts. Impacts to the natural environment are also expected to be minimal.

Recommendation: This segment should be retained for further consideration as it will be necessary to test the cost-effectiveness of a beltway alignment around the Denver metropolitan area.

Exhibit 5-5 summarizes the Level 1 Evaluation of the beltway segments.

EXHIBIT 5-5
Summary of Comparative Scoring of Beltway Segments around Denver – Level 1 Evaluation

Segment	Meets Purpose & Need	One-seat Ride	Faster than RTD in Metro Area	Faster than Auto (Outside Metro Area)	Meets FRA Criteria for Emerging HSIPR Corridor (90 to 100 mph)	Population/ Activity Centers Served	Potential for Environmental Impact	Safety	Probable High Cost	Property Acquisition	Freight Conflicts	Does not Limit Technology Choice	Recommendation for Modelling	Comments
B-1: NW Quadrant		=	+	NA	=	=	−	−	+	+	−	+	+	+	▪ High potential impacts reduce the fulfilment of the Purpose and Need statement ▪ Segment compatible with HSIPR speed criteria ▪ Requires new ROW with possible controversial environmental issues ▪ Lower cost due to at-grade construction
B-2: SW Quadrant		+	+	NA	=	=	=	=	+	+	=	+	+	+	▪ Meets Purpose and Need statement ▪ Segment compatible with HSIPR speed criteria ▪ Public ROW probably available ▪ Possible impacts to Chatfield State Park ▪ Lower cost due to primarily at-grade construction
B-3: SE Quadrant		+	+	NA	=	=	+	+	+	+	+	+	+	+	▪ Meets Purpose and Need statement ▪ Segment compatible with HSIPR speed criteria ▪ Serves employment centers in southeast Denver ▪ Dedicated ROW ▪ Lower cost due to primarily at-grade construction
B-4: NE Quadrant		+	+	NA	=	=	=	+	+	+	+	+	+	+	▪ Meets Purpose and Need statement ▪ Segment compatible with HSIPR speed criteria ▪ Connects northern population centers to DIA ▪ Dedicated ROW ▪ Lower cost due to primarily at-grade construction

LEGEND
+ = Favorable (Likely to have positive impacts, i.e. benefits)
− = Challenging (Likely to have significant negative impacts)
= = Neutral (Likely to have neutral impacts, or mixed positive and negative impacts)

Outside Denver Segments

Denver to Fort Collins

Two segments were evaluated from the Denver metropolitan area to Fort Collins:

- N–1: Railroad Alignment
- N-2: Greenfield

As discussed below and shown in **Exhibit 5-6**, both of these segments are recommendations from previous studies.

N-1: Railroad Alignment (41 miles)

This segment was included as a future commuter rail project as part of the preferred alternative for the North I-25 EIS. Consequently, it is considered to have public and agency support. It would allow a one-seat ride but would not perform to the speeds desired for HSIPR. The curvature of the track afforded by the existing railroad corridor is not suitable for HSIPR in many areas, and there are more than 100 at-grade crossings requiring lower operating speeds for safety.

Because the segment goes through the communities of Longmont, Loveland, and Fort Collins it has the advantage of being proximate to users. Conversely, construction and operational impacts would affect these same communities. The cost of constructing this segment is estimated to be moderate as much of the construction would be at-grade. If grade separation are desired, the costs would increase dramatically.

The use of N-1 would likely limit options to FRA-compliant technology.

Recommendation: This segment, which shares the BNSF ROW, should be retained as it is a supported recommendation from the North I-25 EIS.

N-2: Greenfield (45.5 miles)

A HSIPR located along I-25 traveling north from Denver was a recommendation of the RMRA High-Speed Rail Feasibility Study. This segment would provide a fast, one-seat ride to and from the Denver metropolitan area. N-2 scores well for all the evaluation criteria with the exception that it is located outside of the cities of Longmont, Loveland, and Fort Collins, requiring patrons to travel to the station located in Fort Collins near Harmony Road. Community and environmental impacts are not anticipated to be great, and the cost of construction is anticipated to be comparatively low due to open construction and available ROW.

Recommendation: This segment should be retained as it is a component of the "FRA Developed Option in the RMRA study.

Exhibit 5-6 summarizes the Level 1 Evaluation of the North segments.

EXHIBIT 5-6
Summary of Comparative Scoring of North and South Segments –Level 1 Evaluation

Segment		Meets Purpose & Need	One-seat Ride	Faster than RTD in Metro Area	Faster than Auto (Outside Metro Area)	Meets FRA Criteria for Emerging HSIPR Corridor (90 to 100 mph)	Population/Activity Centers Served	Potential for Environmental Impact	Safety	Probable High Cost	Property Acquisition	Freight Conflicts	Does not Limit Technology Choice	Recommendation for Modelling	Comments
N-1: Rail Corridor		=	+	N/A	–	–	+	=	–	+	=	=	–	+	▪ Anticipated slow operating speeds ▪ Closer to the communities ▪ Limits technology choice ▪ Affects freight operations ▪ Appears to be publically supported
N-2: Greenfield		+	+	N/A	+	+	–	+	+	+	+	+	+	+	▪ Faster travel and may have fewer impacts ▪ Does not limit technologies ▪ Mostly at-grade construction resulting in lower construction costs ▪ Is less favored locally than is N-1
S-1: Rail Corridor		=	+	N/A	–	–	+	=	–	–	–	–	–	+	▪ Anticipated slow operating speeds ▪ Closer to the communities ▪ Limits technology choice ▪ Affects freight operations ▪ Appears to be publically supported
S-2: Greenfield		+	+	N/A	+	+	–	–	+	=	–	+	+	–	▪ Faster travel times ▪ Does not limit technologies ▪ Is not supported locally

LEGEND
+ = Favorable (Likely to have positive impacts, i.e. benefits)
– = Challenging (Likely to have significant negative impacts)
= = Neutral (Likely to have neutral impacts, or mixed positive and negative impacts)

Denver to Colorado Springs and Pueblo

Two segments were evaluated for HSIPR from Denver south to Colorado Springs and Pueblo:

- S-1: Railroad Alignment
- S-2: Greenfield

As discussed below, both of these segments were evaluated in the RMRA study.

S-1: Railroad Alignment

The railroad alignment south of the Denver metropolitan area is referred to as the Joint Line (JL). From Littleton to Colorado Springs, this segment has limited ROW and tight curvature, both of which reduce the effectiveness of this segment for HSIPR. These conditions generally persist to Pueblo. Some curves along the alignment could be flattened in order to increase efficiency of operation. However, topographic constraints in several areas of the existing ROW make geometric changes very difficult; therefore, it will not be possible at reasonable cost to ease all the curves. It is also expected that the over-capacity condition of the freight corridor would require significant acquisition of ROW, resulting in community impacts.

Impacts to the natural environment are expected to be less than those associated with development of a greenfield segment. Additionally, there appears to be support for the railroad alignment in the Colorado Springs area, as it is endorsed by the Pikes Peak Area Council of Governments

The community impacts from accessing the Pueblo area can be largely mitigated with careful planning. Based on limited public input, there is no apparent preference in Pueblo for or against this segment versus a greenfield segment.

The use of S-1 would limit options to FRA-compliant technology.

Recommendation: This segment should be carried forward as it is a component of the "FRA Developed Option in the RMRA study which is supported by the PPACG.

S-2: Greenfield

The greenfield segment provides the opportunity for a faster, more efficient HSIPR segment than does S-1. It is also anticipated that the constructability of this segment would be more favorable than S-1 because the construction would avoid the congested areas of Colorado Springs. The impacts of this segment on the natural environment have the potential to present difficult implementation challenges. Further, the public has expressed serious concerns about a HSIPR traveling through the Black Forest area. The PPACG is also on record as not supporting S-2.

Conversely, the use of S-2 would provide the advantage of allowing all train technologies.

Recommendation: This segment as currently configured should not be carried forward. However, a revised greenfield segment will be defined and carried forward into modeling to measure the impact of higher speeds on ridership and cost-effectiveness.

Exhibit 5-6 summarizes the Level 1 Evaluation of the South segments.

Summary of Segment Evaluation

Exhibit 5-7 presents a summary of the Level 1 segment evaluation. Fourteen of the 18 segments evaluated have been retained for incorporation into the 12 HSIPR alternative scenarios. As noted earlier, all of the East, West, and North/South segments through the Denver metropolitan area are anticipated to have difficult community impacts, involve significant ROW acquisition, and have high costs. However, the ridership effectiveness of these through-Denver segments needs to be tested against the segments that route the HSIPR around the Denver metropolitan area.

EXHIBIT 5-7
Summary of Segment Scoring – Level 1 Evaluation

Segment Name	Disposition	Segment Name	Disposition
W-1: US 6/Gold Line/DUS 	Set aside	E-1: DUS/CML/I-70/ East Corridor/DIA 	Set aside
W-2: I-70/I-76/DUS 	Set aside Reconsider only if Alternative Scenario C-1 is found acceptable.	E-2: DUS/CML/I-70/Pena/DIA 	Incorporate into a HSIPR alternative scenario
W-3: I-70/New Stockyard Station 	Incorporate into a HSIPR alternative scenario	E-3: New Stockyard Station/I-70/Pena/ DIA 	Incorporate into a HSIPR alternative scenario
W-4: I-70/US 6/DUS 	Incorporate into a HSIPR alternative scenario as a design option to W-3	E-4: DUS/CML/96th Avenue/DIA 	Incorporate into a HSIPR alternative scenario as a design option to E-3
NS-1: CML 	Incorporate into a HSIPR alternative scenario	NS-2: CML and Joint Line 	Incorporate into a HSIPR alternative scenario

EXHIBIT 5-7
Summary of Segment Scoring – Level 1 Evaluation

Segment Name	Disposition	Segment Name	Disposition
B-1: Northwest Quadrant 	Set aside	N-1 – Railroad Alignment 	Incorporate into a HSIPR alternative scenario
B-2: Southwest Quadrant 	Incorporate into a HSIPR alternative scenario	N-2 – Greenfield 	Incorporate into a HSIPR alternative scenario
B-3: Southeast Quadrant 	Incorporate into a HSIPR alternative scenario	S-1: Railroad Alignment 	Incorporate into a HSIPR alternative scenario
B-4: Northeast Quadrant 	Incorporate into a HSIPR alternative scenario	S-2: Greenfield 	Set aside Configure a new greenfield segment to replace S-2

Evaluation of HSIPR Alternative Scenarios

The following Level 1 Evaluation shows that of the 12 HSIPR alternative scenarios considered, five are proposed for ridership modeling. This does not necessarily mean that no portions of the remaining seven alternative scenarios will be considered in later evaluation. Rather, modeling of the five alternative scenarios selected is expected to represent the best comparisons for future planning. For example, modeling results will help answer the following questions:

- What is the effect of stopping at DUS versus some other central Denver station location?
- What are the differences in travel time, ridership, and cost-effectiveness between alternative scenarios that circumvent urban areas versus pass through urban areas?
- What is the effect on ridership if HSIPR is constructed as a complete beltway around the Denver metropolitan area versus only a partial beltway or a beltway that traverses only the east or west portions of the Denver metropolitan area?
- What are the impacts of following existing railroad alignments north to Fort Collins or south to Colorado Springs compared to a straighter, faster greenfield segment?

A-Series Alternative Scenarios: Through the Denver Metropolitan Area

The six A-series scenarios were configured to evaluate the performance of HSIPR traveling through the Denver metropolitan area. The results of the evaluation are summarized below and in **Exhibit 5-8**. More detailed information is provided in **Appendix A**.

The intent of this evaluation is to pick the best alternative scenarios for ridership modeling, even though in some cases the cost and environmental considerations are likely to be too great to allow their implementation. Refinement of these alternative scenarios will be made during the engineering and impact analysis in the Level 2 Evaluation.

Any of the HSIPR segments traveling through central Denver in any direction will result in community impacts. Due to many phycial constraints, access to DUS will be very difficult and costly and will result in disruption during construction. The impact to ridership, cost-effectiveness, and community support of not providing a stop at DUS, or providing a stop at another location in central Denver, will need to be tested.

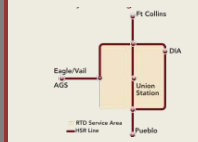
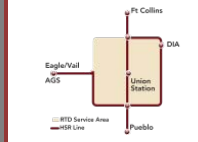
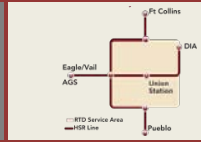
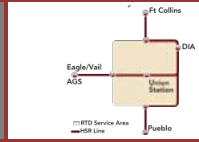
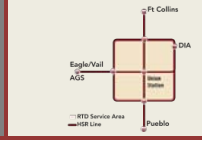
As described below, the costs of alternative scenarios A-1, A-2, and A-3 are anticipated to be similar. A-5 is expected to be the lowest cost, and A-6 the most costly. The impacts of the beltway segments, which are elements of all but one of the A-series alternative scenarios, are expected to be less than the impacts of segments through Denver.

A-1: Direct Alignment through Denver

Denver Metropolitan Area – This alternative scenario is anticipated to perform fairly well as it travels directly through the Denver metropolitan area. It includes options for accessing DUS or a design option for a new station to the north of downtown. Travel speeds will be faster with the optional northern station and faster yet with no stop in central Denver. Access to DUS on a north/south segment is very difficult if not impossible without a high level of construction impacts due to the constraints on the railroad corridor.

It is anticipated that ROW requirements would be high and that the majority of the north/south or east/west segments would be on aerial structure. Impacts to minority and low-income populations, historic properties, and the community in general are expected to complicate the implementation and reduce the public support for this scenario. Compared with the other A-series alternative scenarios, A-1 would have the second greatest impact on the Denver metropolitan area. A-6 is anticipated to have comparable impacts and the added impacts of constructing the beltway segments.

EXHIBIT 5-8
Summary of Comparative Scoring A-Series Alternative Scenarios – Initial Evaluation

A-Series Alternative Scenarios		Meets Purpose & Need	One-seat Ride	Faster than RTD in Metro Area	Faster than Auto (Outside Metro Area)	Meets FRA Criteria for Emerging HSIPR Corridor (90 to 100 mph)	Population/Activity Centers Served	Potential for Environmental Impact	Safety	Probable High Cost	Property Acquisition	Freight Conflicts	Does not Limit Technology Choice	Recommendation for Modelling	Comments
A-1: Direct Routing through Denver		+	+	+	N/A	=	+	–	+	–	–	–	=	+	▪ Shortest segment ▪ Best overall one-seat ride ▪ Anticipated high community impact
A-2: Beltway Excluding SW Quadrant		+	=	+	N/A	=	=	–	+	–	–	–	=	–	▪ Voids the need for expensive east-west segment through central Denver ▪ Poor access to the southwest communitiesLimited ROW in the north/south segment
A-3: Beltway Excluding NW Quadrant		+	=	+	N/A	=	=	–	+	–	–	–	=	–	▪ Avoids acquiring new ROW in the northwest area ▪ Avoids the need for expensive east-west segment though Central Denver ▪ Limited ROW for the north-south segment
A-4: Western Beltway		=	=	+	N/A	=	=	–	+	–	–	+	+	–	▪ Avoids the north-south ROW conflicts with freight ▪ Limited ROW in the north-south segment ▪ Poor access for the northeast and southeast communities
A-5: Eastern Beltway		+	=	+	N/A	=	=	–	+	–	–	+	+	+	▪ Avoids the north-south ROW conflicts with freight ▪ Expected to be a lower-cost alternative ▪ Poor access for the northwest and southwest communities
A-6: Complete Beltway		+	+	+	N/A	=	+	–	+	–	–	–	=	+	▪ Provides the highest number of mobility options ▪ Highest cost (perhaps twice the lowest-cost A-series alternative scenario) ▪ Highest overall environmental impact

LEGEND
+ = Favorable (Likely to have positive impacts, i.e. benefits)
– = Challenging (Likely to have significant negative impacts)
= = Neutral (Likely to have neutral impacts, or mixed positive and negative impacts)

Due to the quantity of ROW acquisition and aerial structure required, the per-mile cost of the A-1 alternative scenario is anticipated to be high. Because it would not share track with the freight railroads, both FRA-compliant and non-compliant technologies could be used in the east/west segment. If railroad ROW were used in the north/south segment, technology would be limited to FRA-compliant. If a new ROW parallel to the freight corridor were acquired, all technologies could be used.

Outside of the Denver Metropolitan Area - At this level of planning, A-1 could be combined with either the railroad (N-1 or S-1) or greenfield (N-2 and S-2) segments outside of the Denver metropolitan area. As discussed earlier, the railroad alignment segments are expected to be slower than the greenfield segments, with neither N-1 nor S-1 anticipated to be effective for HSIPR. The community impacts of railroad alignment N-1, where it travels through Longmont, Loveland, or Fort Collins, could be a concern. Similarly, the community impacts of railroad segment S-1 are anticipated to be challenging, especially through downtown Colorado Springs. The impacts of the greenfield segment N-2 are not expected to be great because the majority of construction is confined to the I-25 corridor. The impacts of the greenfield segment S-2 on the natural environment are anticipated to be high and the segment is not supported by the Black Forest residents.

The impacts of the HSIPR traveling into the I-70 Mountain Corridor will be assessed in the AGS study.

Recommendation: This alternative scenario will be carried forward to test the ridership of a direct routing through the Denver metropolitan area. The alignment is also highly supported by the mountain stakeholders as direct access to DIA is considered critical to the success of the AGS.

A-2: Beltway Excluding the Southwest Quadrant

Denver Metropolitan Area - This alternative scenario provides good access and a one-seat ride from the mountain communities to DIA, but it is not as direct as A-1. The beltway segments would avoid the high community impacts of a direct alignment through Denver in the east-west direction. The exception is the construction of HSIPR in the undeveloped Northwest Quadrant, where the level of impacts to the natural environment is unknown but anticipated to be higher and more controversial than found in the other three developed beltway segments. Conversely, access to DUS on the north-south segment is very difficult if not impossible without a high level of construction impacts due to the constraints on the railroad corridor. A-2 provides no direct access to DUS from the west or east and provides no service to the southwestern portion of the Denver metropolitan area.

Outside of the Denver Metropolitan Area – The impacts of A-2 are the same as described above for A-1.

Recommendation: This alternative scenario is not recommended for modeling because A-1, A-5, and A-6 are anticipated to provide better tests of ridership.

A-3: Beltway Excluding the Northwest Quadrant

Denver Metropolitan Area - This alternative scenario provides good access and a one-seat ride from the mountain communities to DIA, but it is not as direct as either A-1 or A-2. Access to DIA and DUS from the eastern portion of the Denver metropolitan area is similar to A-2. The beltway segments would avoid the high community impact of a direct alignment through Denver in the east-west direction. However, the north-south segments would have the same high impacts as discussed for A-1 and A-2. This alternative scenario offers the advantage of not affecting the Northwest Quadrant, where the level of impacts to the natural environment and the degree of public controversey are unknown.

Like A-2, A-3 provides no direct access to DUS from the west or east. It also provides no service to the northwestern portion of the Denver metropolitan area.

FRA-compliant technologies would likely be required on the north-south segment. All

technologies would be permissible on the beltway segments.

Outside of the Denver Metropolitan Area – The impacts of A-3 are the same as described above for A-1.

Recommendation: This alternative scenario is not recommended for modeling because A-1 and B-2A are anticipated to provide a better test of ridership.

A-4: Western Beltway

Denver Metropolitan Area - This alternative scenario provides good access and a one-seat ride from the mountain communities to DUS and DIA. Access to the north and south is difficult for those traveling from the eastern portions of the Denver metropolitan area. The beltway segments would avoid the significant community impacts of a direct alignment through Denver in the north-south direction. However, similar to A-1, A-5 and A-6, community impacts in the east to west direction are expected to be high.

As stated previously, impacts to the natural environment are presently unknown for construction of HSIPR in the undeveloped Northwest Quadrant.

A-4 provides no direct access to service to the employment centers in the southeastern portion of the Denver metropolitan area.

All technologies would be permissible on all of the segments through the Denver metro area and on the greenfield alignments to Fort Collins and Pueblo. FRA-compliant technology would be required on the railroad alignments (N-1 and S-1) to Fort Collins and Pueblo.

Recommendation: This alternative scenario is not recommended for modeling because scenarios A-1, A-5, and A-6 are anticipated to provide better tests of ridership.

A-5: Eastern Beltway

Denver Metropolitan Area - This alternative scenario provides good access and a one-seat ride from the mountain communities to DUS and DIA. Access to DUS and DIA from the eastern portion of the Denver metropolitan area is also good. Access to these destinations from the northwest and southwest is limited, requiring travel to a HSIPR station. The beltway segments would avoid the significant community impacts of a direct alignment through Denver in the north-south direction. However, the east-west segments would have the same high impacts as discussed for A-1,A-4 and A-6. This alternative scenario also offers the advantage of not affecting the Northwest Quadrant.

Like A-4, this alternative scenario provides no direct access to DUS from the north or south.

Recommendation: This alternative scenario is recommended for modeling because it is anticipated to be the lowest cost option of the A-series scenarios.

A-6: Complete Beltway

Denver Metropolitan Area - This alternative scenario is anticipated to provide the highest ridership of all the alternatives evaluated. It is also expected to have the highest cost and the greatest impacts. A-6 provides the highest level of access to the Denver metropolitan area from all points in the study area. It would allow both FRA-compliant and non-compliant technology on all segments, with the possible exceptions of the north-south segments through Denver and the railroad alignments (N-1 and S-1) outside of the Denver metropolitan area.

Recommendation: This alternative scenario is recommended for modeling because it represents the highest possible ridership of all alternative scenarios evaluated. It will also allow the relative ridership benefits of all segments to be considered.

B- and C-Series Alternative Scenarios: Around the Denver Metropolitan Area

The six B- and C-series alternative scenarios were configured to evaluate the performance of HSIPR traveling around the Denver metropolitan area. The results of the evaluation are summarized below and in **Exhibit 5-9**. Detailed evaluation information is provided in **Appendix A**. As discussed for the A-series alternative scenarios, the intent of the evaluation

is to pick the best segments for ridership modeling. Refinement of these alternative scenarios will be made during the engineering and impact analysis in the Level 2 Evaluation.

Any of the B-series alternative scenarios around the Denver metropolitan area will require a transfer to access DUS and thus do not meet the one-seat ride criterion. Direct access to DIA is provided with all but one of the B- and C-series alternative scenarios, and all are expected to have lower ridership than the A-series alternative scenarios because of the transfers required to access central Denver. Conversely, all of the B- and C-series alternative scenarios are anticipated to be lower cost and have less impact on the Denver metropolitan area than the A-series alternative scenarios.

To varying degrees, the B-series alternative scenarios would allow both FRA-compliant and non-compliant technologies on all the beltway and greenfield segments. Where the alternative scenarios use the railroad segments (N-1 and S-1) outside of the Denver metro area, FRA-compliant technologies would be required. C-1 would permit only FRA-compliant technologies because it shares track with commuter rail.

With the B-series alternative scenarios, the impact to ridership, cost effectiveness, and community support of not providing direct access to DUS will be tested.

The costs of B-1 and C-1 are anticipated to be the lowest because they involve no significant construction within the Denver metropolitan area. B-3 is anticipated to have a lower cost than either B-2 or B-2A because it requires less beltway construction. B-4 is anticipated to be the highest cost because it involves construction in all four quadrants of the beltway.

Similar to the A-series alternative scenarios, the B- and C-series alternative scenarios would include either one of two segments travelling north (N-1 or N-2) and south (S-1 or S-2).

B-1: Denver Periphery

B-1 would not provide a one-seat ride to any area of the state. Since it would construct no new rail facilities inside the Denver metropolitan area, B-1 would result in no costs or impacts inside the developed area. While this alternative scenario may be appropriate for a minimum operable segment (MOS), it would not function as a statewide HSIPR; consequently it would not meet the mobility objectives of the Purpose and Need . The impacts of the HSIPR outside of the Denver metropolitan area would be the same as stated for A-1 above.

Outside of the Denver metropolitan area, FRA-compliant technologies would be required on the railroad segments (N-1 and S-1); all technologies could be deployed on the greenfield (N-2 and S-2) segments.

Recommendation: This alternative scenario will not be modeled because scenarios A-1 and C-1 are more representative of the Purpose and Need as it provides continuous transit service (but not HSIPR service) through the Denver metropolitan area to other portions of the state.

B-2: Denver Periphery Excluding the Southeast Quadrant

This alternative scenario provides a one-seat ride to DIA from the mountain communities and good north-south travel along Colorado's Front Range. It does not provide access from the employment centers and population base in the southeastern Denver metropolitan area. It also involves the environmental unknowns associated with the Northwest Quadrant.

Within the Denver metropolitan area, all technologies could be deployed on the beltway alignments. Outside of the Denver metropolitan area, FRA-compliant technologies would be required on the railroad segments (N-1 and S-1); all technologies could be deployed on the greenfield (N-2 and S-2) segments.

Recommendation: This alternative scenario is not recommended for modeling because B-2A is anticipated to perform better due to the provision of service to the population centers of southeast Denver.

B-2A: Denver Periphery Excluding the Northwest Quadrant

Although it is longer route than B-2, this alternative scenario provides a one-seat ride to DIA from the mountain communities. It also

provides good north-south travel along Colorado's Front Range and access from the employment centers and population base located in the southeast Denver metropolitan area. The environmental unknowns associated with the Northwest Quadrant are avoided.

Similar to B-2, within the Denver metropolitan area, all technologies could be deployed on the beltway segments. Outside of the Denver metropolitan area, FRA-compliant technologies would be required on the railroad segments (N-1 and S-1); all technologies could be deployed on the Greenfield (N-2 and S-2) segments.

Recommendation: This alternative scenario is recommended for modeling because it is important to test a peripheral alignment around the Denver metropolitan area against a direct east-west alignment through Denver such as provided by A-1, A-4, A-5, and A-6.

B-3: Denver Periphery Eastern Beltway

This alternative scenario provides a one-seat ride to DIA from areas north and south of the Denver metropolitan area. However, it requires a transfer to the RTD system for travelers from the mountain communities. It provides good north-south travel along Colorado's Front Range and access from the employment centers and population base located in southeast Denver. Lastly, it avoids the environmental unknowns associated with the Northwest Quadrant.

Similar to B-2 and B-2A, within the Denver metropolitan area, all technologies could be deployed on the beltway segments. Outside of the Denver metropolitan area, FRA-compliant technologies would be required on the railroad segments (N-1 and S-1); all technologies could be deployed on the greenfield (N-2 and S-2) segments.

Recommendation: This alternative scenario is not recommended for modeling because ridership information on the effectiveness of the eastern beltway segments will be provided through the modeling of A-5.

B-4: Denver Periphery Full Beltway

This alternative scenario provides a one-seat ride to DIA from all directions. Travel to DUS would require a transfer to the RTD system. Of the B-series alternative scenarios, it is anticipated to provide the best connectivity to RTD's system and generate the highest ridership. In absolute terms, it represents the greatest potential for environmental impacts during construction, including the unknowns associated with the Northwest Quadrant. It will also have the highest cost of the B- and C-series alternative scenarios.

On the beltway segments, it would allow both FRA-compliant and non-compliant technologies. Outside of the Denver metropolitan area, FRA-compliant technologies would be required on the railroad segments (N-1 and S-1); all technologies could be deployed on the greenfield (N-2 and S-2) segments.

Recommendation: This alternative scenario is not recommended for modeling because A-6 will be modeled to test the ridership effectiveness of a full beltway alignment.

C-1: Shared Track with RTD

This alternative scenario provides a one-seat ride from DIA to the Mountain communities by sharing RTD track. Sharing the RTD East Rail line from DIA to DUS and the Gold Line from DUS to Ward Road in Arvada would require the negotiation of an operating agreement with RTD. Although it would share the same track with RTD, it would only stop at DUS through Denver. This would result in a faster travel time than provided by RTD's East Commuter Rail and Gold Line Communter Rail alignments.

In the north-south direction, the HSIPR could share track with the future RTD North Metro project to DUS. However, a one-seat ride south of this point is thought to be impossible because both RTD's southwest and southeast corridor lines use light rail technology, which would be incompatible with HSIPR technologies. To mitigate this condition a new HSIPR segment would need to be constructed south of DUS. This will be re-engineered during the Level 2 Evaluation.

Sharing track with RTD commuter rail trackage would restrict the HSIPR to technologies that are FRA-compliant. Traveling to the Mountain

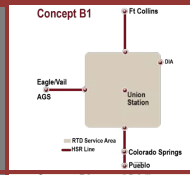
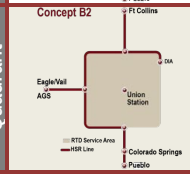
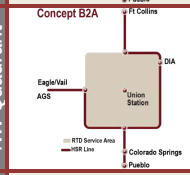
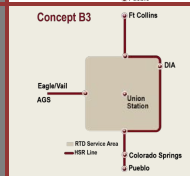
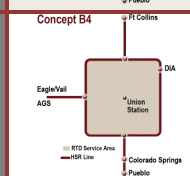
communities, would mean that HSIPR would either be limited to FRA-compliant technology or that a transfer to an AGS technology would be required at a HSIPR station near the C-470/I-70 interchange.

The advantages of this alternative scenario are that it would save the costs of constructing HSIPR through Denver as well as eliminate construction impacts in the urban area. The disadvantages are anticipated slower travel speeds than would be provided by an independent track and resistance from neighborhoods along the RTD alignments to the operation of HSIPR. The concept of sharing RTD track may be combined with the other A- or B-series alternative scenarios as a means to reduce costs and impacts. This alternative scenario could be improved through track and signal upgrades of the RTD system. These upgrades should be further evaluated in a subsequent level of evaluation.

Recommendation: This alternative scenario is recommended for modeling because it tests the effectiveness of sharing existing RTD track for HSIPR.

EXHIBIT 5-9

Summary of Comparative Scoring of B- and C-Series Alternative Scenarios – Level 1 Evaluation

Group B & C Scenarios		Meets Purpose & Need	One-seat Ride	Faster than RTD in Metro Area	Faster than Auto (Outside Metro Area)	Meets FRA Criteria for Emerging HSIPR Corridor (90 to 100 mph)	Population/ Activity Centers Served	Potential for Environmental Impact	Safety	Probable High Cost	Property Acquisition	Freight Conflicts	Does not Limit Technology Choice	Recommendation for Modeling	Comments
B-1: Denver Periphery		−	−	−	N/A	+	−	+	+	+	+	+	−	−	▪ Does not meet the PN ▪ No one seat ride to either DUS or DIA ▪ Lowest cost ▪ Connectivity challenges to existing RTD system
B-2: Denver Periphery Including the NW Quadrant		=	=	−	N/A	+	=	=	+	=	=	+	−	−	▪ Good connection from western communities to the Denver metro area ▪ No one seat ride to DUS ▪ Poor connection to DIA from the south
B-2A: Denver Periphery Excluding the NW Quadrant		=	=	−	N/A	+	+	+	+	=	+	+	=	+	▪ Good connection from western communities to the Denver metro area ▪ Avoids acquiring new ROW in the northwest area ▪ No one seat ride to DUS
B-3: Denver Periphery Eastern Beltway		=	=	−	N/A	+	=	+	+	+	+	+	−	−	▪ Good connection to DIA from the north and south ▪ Avoids acquiring new ROW in the northwest area ▪ Poor connection to DUS and DIA from the western communities
B-4: Denver Periphery Full Beltway		=	=	−	N/A	+	+	=	+	−	=	+	−	−	▪ Provides the highest mobility options ▪ Highest cost ▪ Highest environmental impact of the B/C series
C-1: Denver Periphery Shared Use		=	=	−	N/A	+	+	=	=	+	=	+	−	+	▪ Potentially provides a one seat ride through Denver ▪ High demonstrated use of RTD system ▪ Slower travel through Denver metro area

LEGEND

+ = Favorable (Likely to have positive impacts, i.e. benefits)

− = Challenging (Likely to have significant negative impacts)

= = Neutral (Likely to have neutral impacts, or mixed positive and negative impacts)

Alternative Scenarios Carried Forward Into Ridership Modeling

As shown in **Exhibit 5-10**, five alternative scenarios provide reasonable comparisons for ridership modeling. After testing the performance of these alternative scenarios in the Level 2 Evaluation, it is anticipated that new combinations of the best elements of the Level 1 alternative scenarios will evolve that improve ridership performance, reduce impacts, and improve cost effectiveness. This process will continue until the best alternative scenarios are developed for public consideration, presumably at the Level 3 Evaluation.

EXHIBIT 5-10
Summary of HSIPR Alternative Scenarios Carried Forward

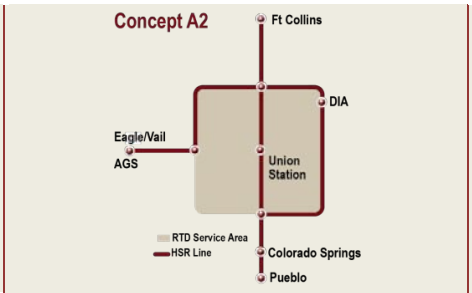
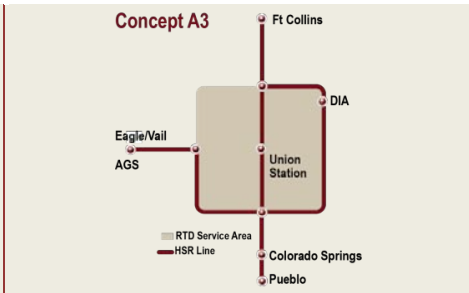
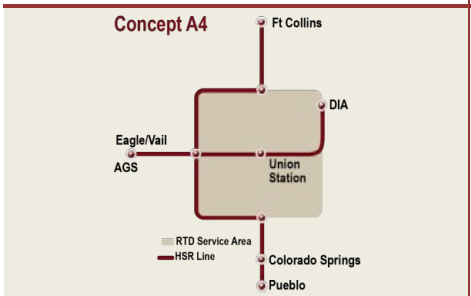
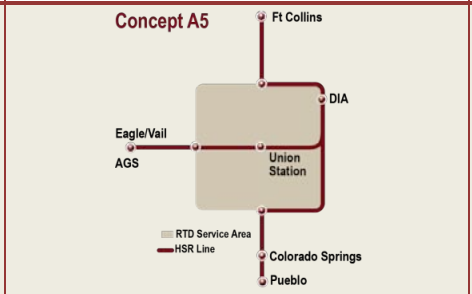
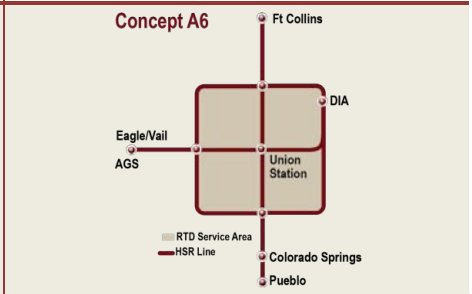
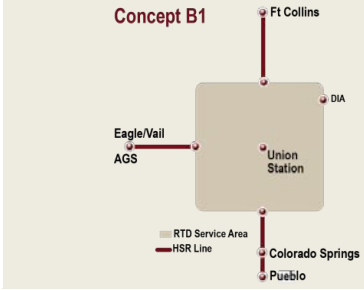
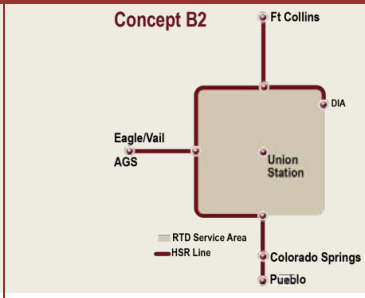
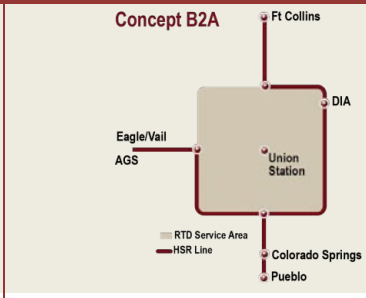
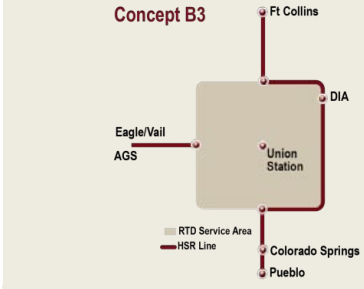
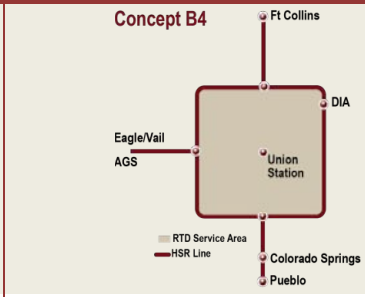
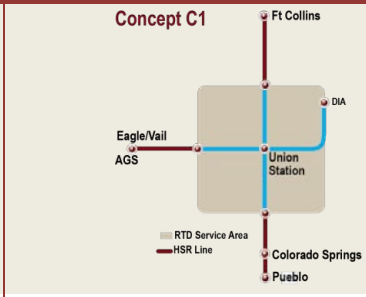
Description and Recommendation: A-Series Alternative scenarios		
		
A-1: Direct Alignments through Denver CARRY FORWARD: This alternative scenario will be carried forward to test the ridership of a direct connection through the Denver metropolitan area. This alignment is also highly supported by the I-70 Mountain Corridor stakeholders as it is considered critical to the success of the AGS. Other benefits include: ▪ Shortest and possibly fastest alternative ▪ One-seat ride to the most destinations ▪ Provides contrast to beltway segments ▪ Allows consideration of all technologies	**A-2: Beltway Excluding the Southwest Quadrant** SET ASIDE: This alternative scenario is not recommended for modelling because A-1, A-5, and A-6 are anticipated to provide a better test of ridership.	**A-3: Beltway Excluding the Northwest Quadrant** SET ASIDE: This alternative scenario is not recommended for modelling because A-1, A-6 and B-2A are anticipated to provide a better test of ridership.
		
A-4: Western Beltway SET ASIDE: This alternative scenario is not recommended for modelling because A-1 and A-6 are anticipated to provide a better test of ridership.	**A-5: Eastern Beltway** CARRY FORWARD:This alternative scenario is recommended for modelling because it is anticipated to be the lowest-cost option of the A-series scenarios. Other benefits include: ▪ Provides a one-seat ride to DIA ▪ Supportive of the AGS ridership ▪ Allows consideration of all technologies	**A-6: Complete Beltway** CARRY FORWARD: This alternative scenario is recommended for modelling because it is anticipated to provide the best ridership of the alternative scenarios considered in the Level 1 Evaluation. Other benefits include: ▪ Provides one-seat ride in all directions ▪ Supportive of the AGS ridership ▪ Potentially highest ridership alternative ▪ Test as a comparison to all others ▪ Demonstrates the case for diminishing returns in ridership versus cost

EXHIBIT 5-10
Summary of HSIPR Alternative Scenarios Carried Forward

<table>
<tr><td></td><td></td><td>▪ Allows consideration of all technologies</td></tr>
<tr><th colspan="3">Description and Recommendation: B and C-Series Alternative Scenarios</th></tr>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>B-1: Denver Periphery
SET ASIDE: This alternative scenario will not be modelled since C-1 would be more representative of the Purpose and Need and would provide continuous HSIPR service through the Denver metropolitan area to other portions of the state.</td><td>B-2: Denver Periphery Excluding the Southeast Quadrant
SET ASIDE: This alternative scenario is not recommended for modelling as A-2 and B-2A are anticipated to perform better due to the fact that both provided service to southeast Denver, whereas B-2 does not.</td><td>B-2A: Denver Periphery Excluding the Northwest Quadrant
CARRY FORWARD:This alternative scenario is recommended for modelling as it is important to test a peripheral alignment around the Denver metropolitan area against a direct east-west alignment through Denver such as provided by A-1, A-4, A-5, and A-6. Other benefits include:
▪ Anticipated to be the best performing of the B-series segments
▪ Avoids the unknowns in the Northwest Quadrant
▪ Allows consideration of all technologies outside of the RTD system</td></tr>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>B-3: Denver Periphery Eastern Beltway
SET ASIDE: This alternative scenario is not recommended for modelling as ridership information on the effectiveness of the eastern beltway segments will be provided through modelling of A-5.</td><td>B-4: Denver Periphery Full Beltway
SET ASIDE: This alternative scenario is not recommended for modelling because A-6 will be used to test the ridership effectiveness of a full beltway alignment.</td><td>C-1: Denver Periphery Shared Track with RTD
CARRY FORWARD: This alternative secenario is recommended for modelling as it is tests effectiveness of sharing existing RTD track for HSIPR. Other benefits include:
▪ Second lowest-cost alternative scenario
▪ Low environmental impacts
▪ Provides a one-seat ride
It was determined that a new segment will need to be re-engineered during Level 2 Evaluation to accommodate HSIPR technology south of DUS through the Denver metropolitan area.</td></tr>
</table>

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Section 6: Public Process

Results of the Level 1 Evaluation Public Involvement Process

This section describes the approach CDOT is taking to engage stakeholders in the ICS process. This approach focuses on ways to reach out to local, regional, state, and federal agencies and presents methods for involving the general public who have an interest in HSIPR.

Once the public involvement process is established, a description of how this process was used for the Level 1 Evaluation is presented. These findings include the feedback received from the Project Leadership Team (PLT) during two formal workshops and input from the general public during four open houses sponsored in Windsor (south of Fort Collins), Denver, Colorado Springs, and Pueblo.

Stakeholder Engagement

At the inception of the ICS, the study team developed a structure for communications and engagement to support sound decision making throughout the study process. A goal of the public involvement process is to consider and incorporate input from local government entities, resource/regulatory agencies, and the public. Collectively, these groups are referred to as stakeholders. Given the significant geography covered by the study, the range of stakeholders reflects the diversity of the study area.

Corridor Coordination Plan – The study team developed a Corridor Coordination Plan in June 2012 as a guide for stakeholder coordination and engagement. This plan describes the role and responsibilities of local governments, agencies, and the public in decision making, discusses a format for coordination, and establishes procedures that will support timely input at key milestones throughout the study process.

Decision Structure – Stakeholder input is focused around major study milestones. Each milestone includes engagement with key stakeholders to review the study recommendations and obtain input. This involves seeking feedback from a Project Management Team (PMT), a Project Leadership Team (PLT), and the general public. Descriptions of these three groups are provided below.

Project Management Team – The PMT includes CDOT project leadership along with representatives from federal and regional agencies and a representative from the AGS study. PMT meetings are conducted at each milestone. The PMT includes:

- CDOT Project Manager
- CDOT Transit and Rail Division Director
- CDOT Transit and Rail Staff
- Consultant Project Manager
- AGS representative
- FRA representative
- FTA representative
- FHWA representative
- RTD representative

Project Leadership Team – The PLT includes representatives from local, regional, and state governments and agencies along the Front Range from Fort Collins to Pueblo, such as:

- Representatives from study area cities and counties
- CDOT region program engineers and planners
- Transportation planning regions, represented by the Chairperson of the Statewide Transportation Advisory Committee (STAC)
- Metropolitan Planning Organization (MPO) representatives
- Railroad representatives
- Colorado Association of Transit Agencies representatives
- Transit and Rail Advisory Committee (TRAC) representatives
- RTD representatives
- Denver International Airport representatives

Public Stakeholders – Public stakeholders include the diverse range of stakeholders within the study area who could benefit and/or be impacted by HSIPR. As with the PMT and PLT, CDOT is engaging the public at each study milestone. The study team uses a variety of methods to engage the public in study details, including the media, a website, email information blasts, and public open houses.

PMT and PLT Engagement

This section focuses on how PMT and PLT input was received and incorporated during the Level 1 Evaluation. The process began with an internal team chartering meeting, followed by two PLT workshops, and concluded with four public open houses to introduce the ICS and obtain input for evaluation.

Internal Team Chartering

In May 2012, members of the PMTs from the ICS and AGS studies met at CDOT Headquarters to charter the study team and confirm the overall vision for the ICS. In addition to PMT members, CDOT's Transit and Rail Director, the Project Manager, the consultant Project Manager, and staff from FRA, FTA, FHWA, and RTD attended. CDOT staff and the consultant team were in attendance to kick off the study, charter the team, discuss the scope, and confirm the vision.

Attendees of the team chartering brainstormed multiple study goals, critical success factors, risks, and mitigations. A few of the key themes identified include:

- Maintain a holistic view of the study (this impacts the entire Front Range and I-70 Mountain Corridor)
- Maintain clear and ongoing communication with stakeholders
- Develop transparency in the ridership modeling process
- Achieve effective coordination and decision making between the ICS and AGS studies
- Identify implementable projects that generate stakeholder support
- Develop credible, transparent, and defensible conclusions
- Work cooperatively with existing transit systems to develop ridership and success for all

PLT Workshop – June 2012

The first PLT workshop was conducted at CDOT Headquarters in June 2012. The study team introduced the study scope, background, and methods for engagement for the PLT and other stakeholders. A presentation was given on the study vision, a proposed project purpose statement, potential HSIPR segments and alternative scenarios, and criteria for the Level 1 evaluation. The PLT members discussed their thoughts regarding the Purpose and Need, criteria, and segments that were presented by the study team. Written feedback was also provided following the meeting. Examples of a few of the key themes identified include:

- Concern related to how the selection of train technology will impact the AGS corridor
- Desire that land use be a key consideration for location of the HSIPR stations
- Questions regarding the potential fares and whether they will cover operating costs
- Desire for criteria to support local communities and regional land use, sustainability, and mobility goals
- Ensure that the planned system adheres to FRA requirements for high-speed rail
- Maintain the study's focus at a regional level
- Maintain compatibility with existing environmental planning documents such as the North I-25 EIS, etc.
- Acknowledge that stations cannot and probably should not be located in every city, otherwise this is not high-speed rail
- Consider survey research, focus groups, or other adequate methods to address public misperceptions about the costs and advantages of mobility modes
- Develop early understanding and ongoing support among key political leaders, interest groups, and media
- Ensure present and future freight rail capacity is maintained

- Promote an integrated Colorado transportation network
- Ensure station locations and corridors complement present and future street, road, and highway networks
- Consider affordability in the initial evaluation as it relates to the demand for other critical services/projects in the state

The Vision Plan of the Pikes Peak Area Council of Governments (PPACG) supports an inter-regional passenger commuter rail alignment along the existing rail line alongside I-25, linking the downtowns of Monument, Colorado Springs, and Fountain.

Based on the feedback received, the study team refined the segments and began to evaluate each using criteria developed for the Level 1 Evaluation.

PLT Workshop – July 2012

The second PLT workshop was held in July 2012 at CDOT Headquarters. The PLT reviewed the progress made since the previous workshop, modifications to the Purpose and Need, details of the scheduled public open houses, and the Level 1 Evaluation results. Again, the opportunity for follow-up written feedback was provided.

At this workshop, the revised Purpose and Need statement generated a fair amount of discussion. While the ICS is not a National Environmental Policy Act (NEPA) study, a Purpose and Need has been requested to ensure consistency should the project be advanced to NEPA in the future. Key discussion themes surrounding the Purpose and Need statement included:

- Ensure the statement is broad enough to cover interregional commuters, business, and tourism travel
- Consider both existing and future mobility demands
- Consider multiple modal options
- Consider land use
- Focus the Purpose and Need toward high-speed rail
- Ensure the Purpose and Need is closely aligned with NEPA

The PLT also reviewed the current segments and the initial evaluation results to be presented to public stakeholders at future Level 1 Evaluation open houses. Key themes of these comments include:

- Identify how options are integrated with the RTD system
- Clarify whether ridership is considered at the Level 1Evaluation stage
- Ridership to DIA will potentially be stronger than to Denver Union Station (DUS).
- Define how economic benefit is considered for each of the alternative scenarios.
- Focus on FRA standards for high-speed rail.
- Support exists for the RMRA station locations
- Locating a station at the National Western Complex would likely not be feasible or generate ridership
- Stopping high-speed rail on the perimeter of the Denver metropolitan area and relying on RTD service to make final connections may negatively impact ridership
- Focus on formal population and employment statistics as published by the MPOs
- Clarify for the public that this network is high speed and not a commuter operation with multiple stops
- Outline the next major steps for the public during the open houses

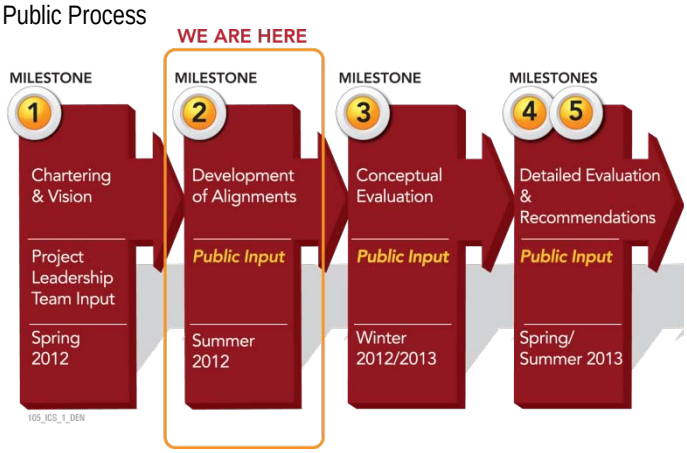
The comments received from the PLT have been considered and were incorporated into the Level 1 Evaluation.

Public Stakeholder Engagement

Integral to the study process is input from the public at each milestone, as illustrated in **Exhibit 6-1**. This input was obtained through a series of open houses with a variety of techniques used to inform participants about the study and to document their thoughts regarding the study vision, a proposed Purpose and Need statement, potential HSIPR segments and

alternative scenarios, and criteria for Level 1 Evaluation.

EXHIBIT 6-1
Public Process



Public Open Houses

The first series of public open houses were conducted at four sites along the Front Range. Members of the public and the media were invited to learn more about the study and provide input to guide the study team's work. Multiple CDOT databases from past projects, including the State Rail Plan, RMRA High-Speed Rail Feasibility Study, and I-70 Mountain Corridor PEIS, were used to notify stakeholders of the open houses. Formal press releases were sent to multiple media outlets two weeks prior to the open houses. Media outlets across the Front Range included notices and articles in local newspapers, radio, and television news broadcasts as a result of the press release. Notifications were also sent to major business organizations (Chambers of Commerce) throughout the Front Range to encourage additional stakeholders to attend. Finally, the PLT members were requested to distribute open house announcements to their constituents.

Each open house presented the same information and utilized the same graphic materials. A 30-minute overview presentation provided information on the study background, segments considered, and Level 1 Evaluation. The open houses were conducted from 4:00 pm to 7:00 pm, with the 30-minute overview presentation at 4:30 pm and repeated at 6:00 pm. Accommodations for persons with physical limitations and Spanish-speaking stakeholders were offered at each open house. The open house dates and locations are noted below.

Colorado Springs Area

July 16, 2012
Pikes Peak Area Council of Governments
15 South Seventh Street, Colorado Springs, CO

Pueblo Area

July 17, 2012
Pueblo Convention Center
320 Central Main Street, Pueblo, CO

Fort Collins Area

July 18, 2012
Windsor Recreation Center
250 North 11th Street, Windsor, CO

Denver Metropolitan Area

July 19, 2012
CDOT Region 1 Offices – Trail Ridge Room
425 C Corporate Circle, Golden, CO

Each open house included a series of presentation boards providing a study overview, details of the segments and alternative scenarios, the study process, the Level 1 Evaluation results, and the study schedule. Detailed aerial maps of the study area were provided to aid discussion with stakeholders and allow stakeholders to write comments directly on the maps. Computer projections of the segment being considered were shown in Google Earth format to aid discussion.

The open houses were well attended and garnered media coverage in local newspapers, radio, and television news outlets. A total of approximately 240 stakeholders attended the four open houses.

Comments were collected through a variety of methods. A comment area was provided at each open house. A hard copy comment form was available, as well as laptop computers for people to type comments directly into the comment database. Study team staff were available throughout the open houses to have one-on-one conversations with stakeholders. Mail in and online website comments were also accepted following the open houses.

Key stakeholder comments by geographic area are highlighted below:

- **Colorado Springs Area –** Many attendees were opposed to the greenfield segment as it crosses through the Black Forest area. They expressed a preference for a segment that follows I-25 or parallels the existing rail corridor and provides service to downtown Colorado Springs. Alternatively, a segment east of the Black Forest was also suggested. Additional noted concerns included noise, forest fires, property impacts, cost, and the appropriateness of high-speed rail versus commuter rail for the Front Range. Attendees suggested several additional criteria, including a cost/benefit comparison of implementing high-speed rail.
- **Pueblo Area –**Some attendees were in favor of a high-speed rail connection along the Front Range extending south to Pueblo and linking to the Pueblo Union Depot. Of those in favour, one concern expressed was the lack of reliable public transit connections to medical services in Denver, especially for the disabled. Others expressed concern over the lack of demand and population density between Colorado cities to support high-speed rail. There were noted reservations regarding Colorado's financial state, the current economic downturn, and the cost to construct and operate HSIPR.
- **Fort Collins Area –** Attendees were well informed of the I-25 North EIS process and the potential transit improvements related to that study. They expressed a mix of support and concern for HSIPR service. Attendees noted support for extending service to Fort Collin's downtown Transit Center regardless of the segment selected. Attendees expressed interest in utilizing the existing BNSF railroad segment between Longmont and Fort Collins and avoiding the I-25 segment as the latter misses the major population centers. Concerns regarding the cost to construct and maintain a HSIPR system were voiced.
- **Denver Area –** Attendees did not indicate any preference for segments through the Denver metropolitan area over segments on the periphery as a route to DIA. Several comments were made that serving the urban population centers is critical and that high-speed rail is essential to tourist travel and the state and local economies. Some attendees noted that DIA may be the key destination, not central Denver or DUS.

A comment form was provided at the workshops to focus stakeholder comments on key questions relevant for this stage of the study. The form also allowed stakeholders to add their general comments on the study. The questions on the form are included below, along with a brief summary of responses received for each question.

- **What do you see as the benefits of High Speed Rail in Colorado?** Many of the responses indicated benefits such as providing connectivity, connecting four major cities along the Front Range, and providing transportation options other than driving, thus bringing Colorado into the 21st Century. Some responses noted that there are no benefits to high-speed rail, there is not enough population in Colorado, and that the concept is not a wise expenditure of tax-payer money.
- **Do you have additional evaluation criteria that should be considered? If yes, what are they?** Over 85 percent of the respondents answered "yes" and suggested additional criteria, including costs (cost/benefits, cost effectiveness), property impacts, and the ability to provide connectivity within the cities. The study team will incorporate these criteria into the increasingly detailed Level 2 and Level 3 Evaluations.
- **Do we have a reasonable range of segments? If not, what additional segments should be considered?** Just over 60 percent of respondents felt that additional segments should be considered. Respondents suggested new segments east of the Colorado Springs area (outside of Black Forest), along I-25 both north and south of the Denver metropolitan area, along the existing railroad corridors, and to city centers or downtowns.
- **Do you have any other comments or concerns about this study?** Responses to this question varied widely. Generally, some were supportive while others were skeptical about the ability of CDOT to provide a workable, cost-effective high-speed rail solution for the Front Range.

The formal comment period for the Level 1 Evaluation closed on August 13, 2012. General study comments can still be made at the study's website at: http://www.coloradodot.info/projects/ICS. Study background details and the materials presented at the public open houses are also available on the website.

The comments received from the public stakeholders will be considered and incorporated into the study as appropriate.

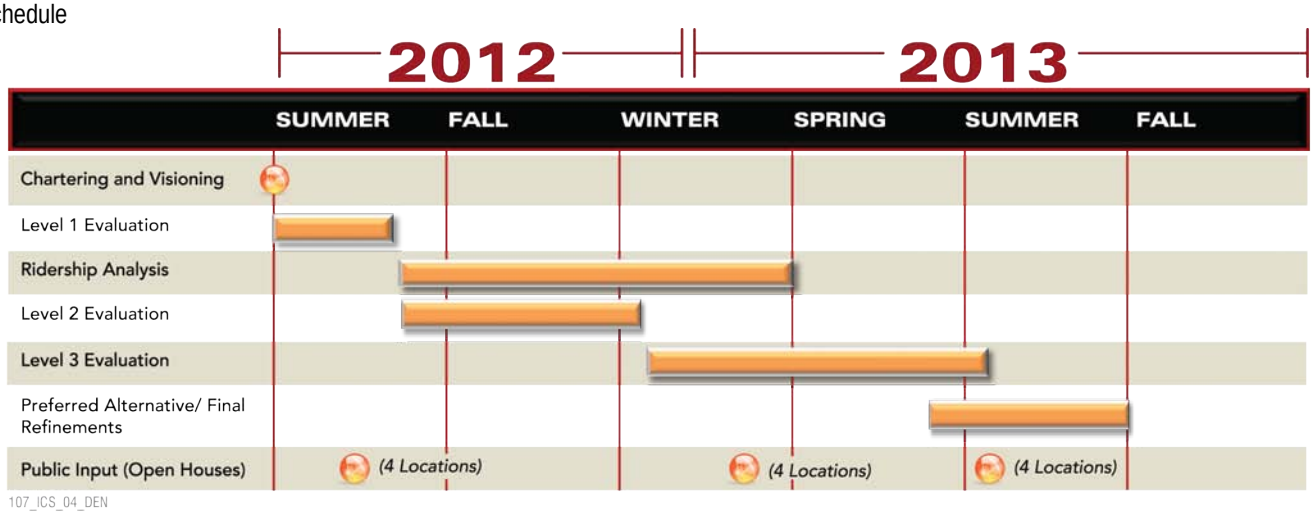
Next Steps

The completion of the Level 2 Evaluation is the next step in the ICS planning process. As shown in **Exhibit 6-2**, this will occur from late summer to winter of 2013. This step involves further development of the alternative scenarios, ridership and revenue estimation, and the actual Level 2 Evaluation. A second series of public open houses is scheduled for late 2012 or early 2013. The Level 3 Evaluation of the alternative scenarios will start in the first quarter of 2013 and continue until early summer of that year.

Specific Work Elements of Level 2 Evaluation

As stated earlier, this involves taking the engineering, planning, and public process evaluations to a higher level of detail, as described on the following page.

EXHIBIT 6-2
Schedule



Engineering Studies

The Level 2 Evaluation engineering studies will involve preparing concept-level CADD drawings for each of the alternative scenarios. This will be done to:

- Assess each segment making up the alternative scenario, in particular the curvilinear constraints, in order to predict the possible top speed of the HSIPR technology
- Determine the general construction footprint of each segment and alternative scenario
- Begin to assess the quantity of aerial structure or tunnel compared to at-grade track
- Provide a conceptual estimate of the property acquisition requirements
- Assess the level of community impact
- Provide parametric cost estimates

Planning Studies

Preliminary operating plan assumptions will be prepared, including headways (interval between trains), number of trains per hour, dwell times at stations (the amount of time a train is stopped at a station for passenger boarding and alighting), and train capacity requirements.

Additional planning tasks include:

- Begin to assess the overall social, economic and environmental benefits associated with implementing HSIPR
- Develop assumptions on the types of technologies to be considered
- Define general station locations
- Define the general programming requirements for stations to define ROW needs
- Determine the need for maintenance facilities and other support facilities to estimate costs and ROW needs
- Prepare the travel demand model and preliminary ridership estimates
- Calculate preliminary revenue estimates
- Define preliminary funding requirements
- Gain agreement on the approach to benefit/cost analysis
- Prepare preliminary benefit/cost estimates
- Assess the level of environmental and community impacts

Public Involvement

The study team will conduct special geography-based meetings with the PLT and stakeholders in Denver, Fort Collins, Colorado Springs, and Pueblo to discuss specific issues related to the location of HSIPR through or around their communities.

The website will continue to be updated as work is developed.

Additional PLT meetings will be held in December 2012.

Additional public open houses will be conducted in Denver, Fort Collins, Colorado Springs, and Pueblo in late 2012 or early 2013.

Additional Alternatives Resulting from the Level 1 Evaluation

As a result of the Level 1 Evaluation, three new segments were recommended as a result of the public process or through further review by the project team. These will be refined in the Level 2 Evaluation. They include:

1. **I-70 ROW /I-76 ROW/96th Avenue/DIA** - Use of the I-76 ROW from I-70 traveling east to 96th Avenue to DIA. A new station would be provided near the intersection of the North Metro Commuter Rail and I-76. DUS would not be accessed in the East/West direction.
2. **New Greenfield Segment from Denver to Colorado Springs and Pueblo** – Due to concerns about impacts to the Black Forest community, a new HSIPR greenfield segment would be defined that generally follows the I-25 south and BNSF ROWs from south Denver to Colorado Springs and Pueblo. This segment will be re-engineered as part of the Level 2 Evaluation.
3. **Revisions to Alternative Scenario C-1: Denver Periphery Shared Track with RTD** –Because it is not possible to share either the RTD Southeast or Southwest LRT track with HSIPR technologies a new segment will be defined during the Level 2 Evaluation from DUS to south of the Denver metropolitan area. Sharing track with RTD's East Commuter Rail to DIA, North Metro Commuter Rail from DUS to the north and the Gold Line Commuter Rail from DUS to Golden is still being considered as part of this scenario.