# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>viii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>ix</td>
</tr>
<tr>
<td>List of Acronyms</td>
<td>xi</td>
</tr>
</tbody>
</table>

## Executive Summary

- Introduction ................................................. ES-1
- Purpose ......................................................... ES-1
- Study Area ...................................................... ES-1
- Corridor Budget ............................................. ES-1
- Evaluation Process ....................................... ES-1

## Corridor Purpose and Need

- Planned 2020 RTP Improvements .................. ES-2
- Mobility Issues .............................................. ES-2
- Community Issues ......................................... ES-2

## Alternatives Evaluated

- Conceptual-Level Alternatives ...................... ES-3
- Detailed-Level Alternatives ......................... ES-3

## Decision Process

- Presentation of the Detailed Evaluation Results (Step 1) ......................... ES-5
- Development of LPA Packages (Step 2) ................................. ES-5
- Evaluation and Short-Listing of Alternative Packages (Steps 3 and 4) ........ ES-5
- Selection of the Draft LPA ................................ ES-6

## Summary Description of the LPA

- Key Elements ................................................ ES-7
- Operating Plan .............................................. ES-7
- Stations ....................................................... ES-7
- LRT Maintenance Facility ............................... ES-7
- Bus System Changes ...................................... ES-7
- TSM (Transportation Systems Management) Improvements .................. ES-8

## Costs

- Benefits ....................................................... ES-9
- Community Impacts .................................... ES-9
- Natural Resource Impacts .............................. ES-9
- Ridership Forecast Update .............................. ES-9

## Introduction

- Background .................................................. 1-1
- Relationship to the Regional Planning Process ................ 1-1
- I-70 Denver to Golden MIS Study Area ............... 1-2
- MIS Process ................................................. 1-2
MIS Coordination .................................................................................................................. 1-3
Decisionmaking Process .................................................................................................... 1-3
Purpose of Report .............................................................................................................. 1-4
Organization of this Report .............................................................................................. 1-4

2 Public Involvement Process ........................................................................................... 2-1
Advisory Committees ....................................................................................................... 2-1
    Policy Advisory Committee ....................................................................................... 2-1
    Technical Advisory Committee .................................................................................. 2-1
Citizens Task Force .......................................................................................................... 2-1
Other Briefings .................................................................................................................. 2-2
Neighborhood and Business Outreach .......................................................................... 2-2
    Community Leader Interviews ................................................................................. 2-3
    Colorado Motor Carriers (CMC) ............................................................................. 2-3
Neighborhood and Business Meetings ............................................................................ 2-4
Environmental Justice ...................................................................................................... 2-4
Public Meetings .................................................................................................................. 2-4
Newsletters and Internet Communication ...................................................................... 2-5
Community Issues ........................................................................................................... 2-5
    Community/Neighborhood Issues ............................................................................ 2-5
Transportation Issues ...................................................................................................... 2-5
Finance and Economics .................................................................................................... 2-5
Environmental Issues ...................................................................................................... 2-5
Construction Issues ........................................................................................................... 2-6

3 Project Initiation .......................................................................................................... 3-1
Existing Conditions ......................................................................................................... 3-1
    Population and Employment ................................................................................... 3-1
    Land-Use Trends ...................................................................................................... 3-1
        Residential .......................................................................................................... 3-1
        Industrial ............................................................................................................. 3-1
        Commercial ....................................................................................................... 3-2
    Environmental Justice .............................................................................................. 3-2
    Environmental Constraints ....................................................................................... 3-2
        Parks, Open Space, and Cemeteries .................................................................... 3-2
    Schools ..................................................................................................................... 3-3
    Water Resources .................................................................................................... 3-3
Historical Sites ................................................................................................................... 3-3
Hazardous Waste ............................................................................................................. 3-5
Transportation Conditions ............................................................................................... 3-5
    Major Roadways ...................................................................................................... 3-5
        East-West Arterials ............................................................................................... 3-5
        North-South Arterials ........................................................................................... 3-6
    Other Arterials ......................................................................................................... 3-6
I-70 Structure Conditions ............................................................................................... 3-6
Traffic Volumes ................................................................................................................. 3-8
Traffic Congestion ............................................................................................................ 3-9
4 Development and Screening of Alternatives ...........................................4-1
Development of Alternatives ..................................................................4-1
Description of Screening-Level Alternatives ...........................................4-2
  1.0 No-Build Alternative .......................................................................4-2
  2.0 Transportation System Management Alternative ................................4-2
    Roadway Improvements .....................................................................4-2
    Transportation Operational Improvements ........................................4-2
  3.0 Highway Alternatives .....................................................................4-2
  4.0 Bus/HOV Alternatives .....................................................................4-3
  5.0 LRT Alternatives ............................................................................4-5
  6.0 Advanced/Emerging Technologies Alternative ..................................4-5
  7.0 Commuter Rail/Diesel Multiple Unit (CR/DMU) Technology Alternatives4-6
  8.0 Conventional Commuter Rail Alternative ......................................4-6
Screening Process .....................................................................................4-7
Pre-screening .........................................................................................4-7
Conceptual Screening Criteria .................................................................4-7
  Consistency with Regional Goals and Policies ....................................4-8
  Affordability .......................................................................................4-8
  Environmental Impacts .......................................................................4-8
  Community Impacts ...........................................................................4-8
  Community Support ...........................................................................4-8
  Consistency with Local Goals and Plans ............................................4-8
  Mobility .............................................................................................4-8
  Agency Acceptability .........................................................................4-8
Results of Conceptual Screening ..............................................................4-9
  1.0 No-Build Alternative .....................................................................4-9
  2.0 Transportation System Management Alternative ..........................4-9
  3.0 Highway Alternatives .....................................................................4-9
  4.0 Bus/HOV Alternatives .....................................................................4-9
  5.0 LRT Alternatives ............................................................................4-15
5 Detailed Evaluation of Final Alternatives

Description of the Final Alternatives

Alternative 1—No-Build (NB)

Key Features

Alternative 2—Transportation System Management

Bus System Improvements

Local Route Modifications

Limited Route Modifications

Express Route Modifications

Regional Route Modifications

SkyRide Route Modifications

Alternative 3B—Highway Widening (HY)

Roadway Improvements

Structure Modifications

Bus System Improvements

Alternative 4A—Bus/HOV

Roadway Improvements

Bus System Improvements

Express Route Modifications

Alternative 5C—Light Rail Transit on the Gold Line and I-70 Alignments

Operating Plan

Alignment Locations and Improvements

Stations

Bus System Improvements

Local Route Modifications

Limited Route Modifications

Express Route Modifications

SkyRide Route Modifications

TSM Improvements

Alternative 7A—Commuter Rail/Separate Track

Preliminary Operating Plan

Passing Track

Stations

Alignment Locations

Right-of-Way Requirements

D MU Maintenance Facility

Bus System Improvements

Limited Route Modifications

Express Route Modifications

SkyRide Route Modifications

TSM Improvements

Alternate 8A—Commuter Rail/Shared Track

Preliminary Operating Plan

Alignment Locations and Improvements
6 Development of the Locally Preferred Alternative ............................................................ 6-1

Decision Process ............................................................................................................... 6-1

Presentation of the Detailed Evaluation Results ............................................................. 6-1

A New Alternative is Developed .................................................................................. 6-1

Development of LPA Packages .................................................................................... 6-1

Evaluation and Short-Listing of Alternative Packages ................................................ 6-2

CTF Actions ................................................................................................................... 6-2

TAC Actions ................................................................................................................... 6-2

PAC Actions ................................................................................................................... 6-2

Commuter Rail Alternatives ......................................................................................... 6-2

Selection of the Draft LPA ............................................................................................. 6-2

Description of the LPA .................................................................................................. 6-4

Key Elements .................................................................................................................. 6-4

Operating Plan ............................................................................................................... 6-4

Alignment Locations and Improvements ..................................................................... 6-4

Phase I Alignment ........................................................................................................... 6-5

Summary of Grade Crossings ....................................................................................... 6-5

Stations ........................................................................................................................... 6-8

Phase I ............................................................................................................................. 6-8

Phase II ........................................................................................................................... 6-8

LRT Maintenance Facility ............................................................................................ 6-8

Bus System Changes ..................................................................................................... 6-8

Specific Modifications ................................................................................................... 6-8

Local Route Modifications ............................................................................................ 6-8

Stations ........................................................................................................................... 5-16

Right-of-Way Requirements .......................................................................................... 5-16

Bus System Improvements .......................................................................................... 5-16

TSM Improvements ...................................................................................................... 5-16

Detailed Evaluation ....................................................................................................... 5-17

Evaluation Criteria ......................................................................................................... 5-17

General Groupings of Criteria ...................................................................................... 5-17

Results of Detailed Evaluation ...................................................................................... 5-17

Cost Measures ............................................................................................................... 5-17

Effectiveness ................................................................................................................... 5-18

Cost-Effectiveness ......................................................................................................... 5-21

Cost per New User ......................................................................................................... 5-21

Environmental and Community Impacts .................................................................... 5-21

Acres Disturbed ............................................................................................................. 5-22

4(f) Parks ......................................................................................................................... 5-23

Environmental Justice ................................................................................................. 5-23

Displacements ................................................................................................................ 5-24

Neighborhood Disruption ............................................................................................ 5-24

Land-Use Compatibility ............................................................................................... 5-25

Economic Development Potential ................................................................................ 5-25

Noise ............................................................................................................................... 5-26

Visual Impacts ................................................................................................................ 5-26
Limited Route Modifications ................................................................. 6-11
Express Route Modifications ................................................................. 6-11
Regional Route Modifications ............................................................... 6-11
skyRide Route Modifications ................................................................. 6-11
Transportation Systems Management Improvements ......................... 6-12
Consequences of Implementing the LPA ................................................. 6-12
Costs Considerations .............................................................................. 6-12
  Capital Cost .......................................................................................... 6-12
  Annual Operations and Maintenance Cost .............................................. 6-13
Mobility Benefits ..................................................................................... 6-13
Community Considerations .................................................................... 6-13
  Potential Impacts .................................................................................. 6-13
  Benefits .................................................................................................. 6-14
Potential Natural Resource Impacts ....................................................... 6-14
Implementation ....................................................................................... 6-15

References .................................................................................................. 7-1

Appendix A: Membership Lists of the Policy Advisory Committee, Technical Advisory Committee, and the Citizen’s Task Force

Appendix B: Documentation of Travel Demand Model Results for the I-70 Denver to Golden MIS Locally Preferred Alternative (LPA); Old versus New DRCOG Land-Use Data
List of Tables

Table 3-1  Study Area Population and Employment Forecasts
Table 3-2  North-South Arterials in the Study Area
Table 3-3  I-70 Structure Condition in the I-70 Denver to Golden Study Area
Table 3-4  I-70 Average Annual Daily Traffic Counts (two-way) by Segment, 1975-1996
Table 3-5  I-70 Vehicle Classification
Table 3-6  I-70 West Transit Facilities
Table 3-7  RTD Bus Routes and Service Characteristics
Table 3-8  Ridership Characteristics at I-70 West park-n-Rides
Table 4-1  Summary of Conceptual Screening Evaluation Matrix: Denver to Golden MIS—I-70 Alignment Alternatives
Table 5-1  No-Build Alternative Improvements
Table 5-2  Capital Cost by Alternative
Table 5-3  Operations and Maintenance Cost by Alternative
Table 5-4  Total Annual Cost by Alternative
Table 5-5  Effectiveness Criteria
Table 5-6  Capacity by Alternative Mode
Table 5-7  Number of New Users per Alternative
Table 5-8  Congestion by Alternative
Table 5-9  Travel Time by Alternative
Table 5-10  Cost per New User Year 2020
Table 5-11  Most Significant Impact Measures
Table 5-12  Acres Disturbed by Alternative
Table 5-13  Potential for Visual Impact
Table 6-1  Summary Assessment of Alternative Packages
Table 6-2  Information Used as the Basis for Selection of the LPA
Table 6-3  Capital Cost Estimate
Table 6-4  LPA Operations and Maintenance Cost
**List of Figures**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure ES-1</td>
<td>Locally Preferred Alternative LRT Elements</td>
</tr>
<tr>
<td>Figure ES-2</td>
<td>LPA Proposed TSM Elements</td>
</tr>
<tr>
<td>Figure 1-1</td>
<td>Study Area</td>
</tr>
<tr>
<td>Figure 1-2</td>
<td>MIS Process</td>
</tr>
<tr>
<td>Figure 2-1</td>
<td>Public Involvement Process</td>
</tr>
<tr>
<td>Figure 2-2</td>
<td>Neighborhood and Business Outreach</td>
</tr>
<tr>
<td>Figure 3-1</td>
<td>Environmental Constraints</td>
</tr>
<tr>
<td>Figure 3-2</td>
<td>Schools</td>
</tr>
<tr>
<td>Figure 3-3</td>
<td>Water Resources</td>
</tr>
<tr>
<td>Figure 3-4</td>
<td>Lane Counts for Key Roadways</td>
</tr>
<tr>
<td>Figure 3-5</td>
<td>Traffic Count Data</td>
</tr>
<tr>
<td>Figure 3-6</td>
<td>1996 Accident Statistics</td>
</tr>
<tr>
<td>Figure 3-7</td>
<td>Projected 2020 Two-Way Traffic Volumes</td>
</tr>
<tr>
<td>Figure 3-8</td>
<td>Passenger Boarding/Alighting Activity at Olde Town park-n-Ride</td>
</tr>
<tr>
<td>Figure 3-9</td>
<td>Passenger Boarding/Alighting Activity at Ward Road park-n-Ride</td>
</tr>
<tr>
<td>Figure 3-10</td>
<td>Railroad Lines in the Study Area</td>
</tr>
<tr>
<td>Figure 3-11</td>
<td>Existing and Proposed Bike and Pedestrian Trails</td>
</tr>
<tr>
<td>Figure 4-1</td>
<td>Development of Initial Alternatives</td>
</tr>
<tr>
<td>Figure 4-2</td>
<td>Highway Improvement Alternatives Considered During Screening</td>
</tr>
<tr>
<td>Figure 4-3</td>
<td>Bus/HOV Alternatives Considered During Screening</td>
</tr>
<tr>
<td>Figure 4-4</td>
<td>LRT Alternatives Considered During Screening</td>
</tr>
<tr>
<td>Figure 4-5</td>
<td>Commuter Rail Alternatives Considered During Screening</td>
</tr>
<tr>
<td>Figure 5-1</td>
<td>Alternative 1 — No-Build 2020 RTP Improvements</td>
</tr>
<tr>
<td>Figure 5-2</td>
<td>Alternative 2 — TSM Proposed Elements</td>
</tr>
<tr>
<td>Figure 5-3</td>
<td>Alternative 2 — TSM Bus Network</td>
</tr>
<tr>
<td>Figure 5-4</td>
<td>Alternative 3B — Highway Widening Proposed Elements</td>
</tr>
<tr>
<td>Figure 5-5</td>
<td>Alternative 4A — Bus/HOV Proposed Elements</td>
</tr>
<tr>
<td>Figure 5-6</td>
<td>Alternative 5C — LRT Proposed Elements</td>
</tr>
<tr>
<td>Figure 5-7</td>
<td>Alternative 7A — Commuter Rail/Separate Track Proposed Elements</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>5-8</td>
<td>Alternative 8A — Commuter Rail/Shared Track Proposed Elements</td>
</tr>
<tr>
<td>6-1</td>
<td>LPA Alignment from DUT</td>
</tr>
<tr>
<td>6-2</td>
<td>1-70 MIS LPA LRT Alignment</td>
</tr>
<tr>
<td>6-3</td>
<td>LPA — LRT to Golden</td>
</tr>
<tr>
<td>6-4</td>
<td>LPA Proposed TSM Elements</td>
</tr>
</tbody>
</table>
### List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C</td>
<td>acceleration/deceleration</td>
</tr>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>AGT</td>
<td>Automated Guideway Transit</td>
</tr>
<tr>
<td>BN/SF</td>
<td>Burlington Northern/Santa Fe</td>
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<tr>
<td>CAPX</td>
<td>Capital Expense</td>
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<td>CBD</td>
<td>Central Business District</td>
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<td>Colorado Department of Transportation</td>
</tr>
<tr>
<td>CERCLA</td>
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</tr>
<tr>
<td>CMC</td>
<td>Colorado Motor Carriers</td>
</tr>
<tr>
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<td>Consolidated Main Line</td>
</tr>
<tr>
<td>CPV</td>
<td>Central Platte Valley</td>
</tr>
<tr>
<td>CR</td>
<td>Commuter Rail</td>
</tr>
<tr>
<td>CTC</td>
<td>Centralized Traffic Control</td>
</tr>
<tr>
<td>CTF</td>
<td>Citizen’s Task Force</td>
</tr>
<tr>
<td>CVO</td>
<td>Commercial Vehicle Operation</td>
</tr>
<tr>
<td>DE</td>
<td>Detailed Evaluation</td>
</tr>
<tr>
<td>DEIS</td>
<td>Draft Environmental Impact Statement</td>
</tr>
<tr>
<td>DIA</td>
<td>Denver International Airport</td>
</tr>
<tr>
<td>DMU</td>
<td>Diesel Multiple Unit</td>
</tr>
<tr>
<td>DRCOG</td>
<td>Denver Regional Council of Governments</td>
</tr>
<tr>
<td>DUT</td>
<td>Denver Union Terminal</td>
</tr>
<tr>
<td>E&amp;C</td>
<td>Existing plus Committed Improvements</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>E/O</td>
<td>Exit/Off-ramp</td>
</tr>
<tr>
<td>EB</td>
<td>Eastbound</td>
</tr>
<tr>
<td>EJ</td>
<td>Environmental Justice</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
</tbody>
</table>
FO  Functionally Obsolete
FRA  Federal Railroad Administration
HBW  home-based work
HOV  High Occupancy Vehicle
HY  Highway Widening
ISTEA  Intermodal Surface Transportation Efficiency Act of 1991
ITS  Intelligent Transportation System
LPA  Locally Preferred Alternative
LRT  Light Rail Transit
LRV  Light Rail Vehicle
mph  miles per hour
MIS  Major Investment Study
NB  No-Build
NEPA  National Environmental Policy Act
O&M  Operations and Maintenance
PAC  Policy Advisory Committee
PE  Preliminary Engineering
PRT  Personal Rapid Transit
RAQC  Regional Air Quality Council
RCRA  Resource Conservation and Recovery Act
ROW  right-of-way
RR  Railroad
RTD  Regional Transportation District
RTP  DRCOG 2020 Regional Transportation Plan
SD  Structurally Deficient
SH  State Highway
STIP  Statewide Transportation Improvement Program
SWA  State Wildlife Area
T&E  Threatened and Endangered
TAC  Technical Advisory Committee
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAZ</td>
<td>Traffic Analysis Zone</td>
</tr>
<tr>
<td>TIP</td>
<td>Transportation Improvement Program</td>
</tr>
<tr>
<td>TMO</td>
<td>Transportation Management Organizations</td>
</tr>
<tr>
<td>TOD</td>
<td>Transit-Oriented Development</td>
</tr>
<tr>
<td>TSM</td>
<td>Transportation System Management</td>
</tr>
<tr>
<td>UP</td>
<td>Union Pacific</td>
</tr>
<tr>
<td>v/c</td>
<td>volume/capacity</td>
</tr>
<tr>
<td>VMT</td>
<td>Vehicle Miles Traveled</td>
</tr>
<tr>
<td>WB</td>
<td>Westbound</td>
</tr>
</tbody>
</table>
Executive Summary

Introduction

Purpose
The Regional Transportation District (RTD) has studied the Burlington Northern/Santa Fe (BN/SF) corridor (also known as the Gold Line) several times in the past decade to determine if it could be operated as a commuter rail corridor. In 1997, the commuter rail line was included in RTD’s Guide the Ride Plan and was referred to as the Gold Line Commuter Rail project. After Guide the Ride failed in November 1997, the RTD Board decided to conduct a Major Investment Study (MIS) on the I-70 Denver to Golden Corridor. The purpose of the MIS is to identify a reasonable mix of alternatives and a Locally Preferred Alternative (LPA) for improving mobility problems in the corridor within a defined budget, while considering public support, and environmental and community impacts. This is consistent with federal guidance that specifies that a systematic analysis of the costs and benefits of proposed improvements be evaluated prior to incorporation in regional plans and before any requests for federal funds.

Study Area
The study area for the Denver to Golden MIS is generally bounded by I-25 to the east, the BN/SF Railroad right-of-way (ROW) (Gold Line) to the north, the City of Golden to the west, and West 38th Avenue to the south. A total of eight local jurisdictions are affected by the study area corridor, including the cities of Denver, Lakeside, Mountain View, Arvada, Wheat Ridge, and Golden, as well as unincorporated portions of Adams and Jefferson counties.

Within the City of Denver, the study area is comprised of the city’s northwest neighborhoods, including Regis and Berkeley west of Federal Boulevard, and Chaffee Park, Sunnyside, Highland, and the western portion of Globeville east of Federal Boulevard. North of the city limits is a sparsely populated portion of unincorporated Adams County along the Clear Creek floodplain. To the west of Sheridan Boulevard, the study area includes the northern portion of Wheat Ridge and southern portion of Arvada, as well as the City of Lakeside. West of Youngfield Street is predominately unincorporated Jefferson County, which is largely rural, but does include the Coors Brewery Plant and the Coors Technology Center. The western terminus of the study area is the City of Golden.

Corridor Budget
RTD defined a budget for corridor improvements of approximately $320 million in 1997 dollars, or roughly $20 million per mile for the 16-mile corridor. A conceptual budget was set to provide a reasonable financial boundary for developing implementable alternatives. There is some flexibility in this amount, and it may be extended by up to 20 percent to a maximum of $384 million. Based on the results of the Detailed Evaluation, there is a high probability that the selected LPA can be implemented within the planned budget.

Evaluation Process
A multistep evaluation process examined a full template of alternative transportation modes and alignment options for the corridor. The process moved from a broad assessment of 17 preliminary concepts to the detailed analysis of seven specific alternatives. The scope of work for the MIS included the following steps:
Project initiation

Pre-screening of a long list of transportation mode and alignment alternatives

Screening of Conceptual Level Alternatives

Detailed Evaluation of alternatives

Project completion—identifying the preferred alternative

Public involvement (throughout all the above-referenced steps)

The evaluation criteria and methodologies used in this study were consistent with the RTD Guidance Manual for conducting MISs. The criteria categories include cost; effectiveness; cost-effectiveness; and environmental and community impacts.


corridor purpose and need

This section describes key planning conditions that were considered for the MIS, including 2020 Regional Transportation Plan (RTP) improvements, mobility issues, and community issues.

planned 2020 RTP improvements

The RTP includes approximately $149 million in highway-oriented investment in the I-70 Denver to Golden Corridor. These improvements include adding one additional lane in each direction to I-70 from Wadsworth Boulevard to State Highway (SH) 58 for $33 million; and adding one additional lane in each direction on I-76 from Wadsworth Boulevard to I-25 for approximately $62 million. Additionally, $53 million of interchange improvements are planned for SH 58/I-70, Ward Road/I-70, and Kipling Street/I-70.

Arterial improvements include the addition of one lane in each direction on Wadsworth Boulevard from U.S. 6 to West 64th Avenue. A grade separation is planned at the BN/SF Railroad and Wadsworth Boulevard (not included in the dollar total above).

mobility issues

I-70 serves not only as the lifeline for the communities along the corridor, but is the primary element of transport of people and goods on both the eastern and western slopes of Colorado. It carries more than 55 percent of the state’s transmountain traffic and is an increasingly important truck route for the movement of freight.

Although the corridor is growing at a rate slightly less than the metropolitan area as a whole, the population is anticipated to increase by over 30 percent by the year 2020. Year 2020 traffic volume projections indicate 11 lane miles of severe congestion and duration greater than 3 hours under the No-Build (NB) Alternative on I-70. Automobile travel times from Golden to Denver Union Terminal (DUT) are anticipated to degrade from 30 minutes today during the morning peak period to 41 minutes under the NB Alternative in 2020. Additionally, severe congestion is projected for essentially all major north-south arterials, including Federal Boulevard, Wadsworth Boulevard, Kipling Street, and Ward Road.

Community Issues

The cities of Golden (incorporated Jefferson County) and Wheat Ridge residents are typically concerned with preservation of quality of life and maintenance of a small town environment. The impacts of new transportation projects are also a concern.

The City of Arvada is planning for transit to help define the urban form of the city through the use of transit-oriented development in their Olde Town area and for redevelopment of the Ridge Home site. Fixed guideway alternatives located along the Gold Line would support these objectives.

Some neighborhoods in Northwest Denver are concerned that transportation investments that result from this MIS benefit their neighborhoods directly. The project team heard from these community members and some elected officials in Denver that LRT on the I-70 alignment is the favored alternative because of its proximity to Northwest Denver.
neighborhoods. Use of a Gold Line alignment for LRT for these citizens is not strongly supported because there is a perception that direct LRT service is not possible.

In public meetings attended principally by individuals residing adjacent to I-70 and some of the public officials that represent these neighborhoods, however, strong opposition was voiced regarding an I-70 LRT alignment because the perceived impacts outweigh any perceived benefit.

Alternatives Evaluated

As discussed below, a broad spectrum of mode and alignment alternatives were evaluated at the conceptual and detailed level of analyses. These alternatives were used to test the values and preferences of citizens residing in the corridor.

Conceptual-Level Alternatives

Seventeen Conceptual-Level alternatives were evaluated at the screening level:

- Alternative 1—No-Build (NB) Alternative
- Alternative 2—Transportation System Management (TSM)
- Alternative 3A—Add two lanes on I-70 from SH 58 to I-76
- Alternative 3B—Add two General-Purpose Lanes on I-70 from Wadsworth to I-25
- Alternative 3C—Add two lanes on I-76 from I-70 to I-25
- Alternative 3E—High-Tech Platform with Moveable Barriers (Zipper Lanes) from Wadsworth to I-25
- Alternative 4A—Buffered Bus/High Occupancy Vehicle (HOV) lanes on I-70 from SH 58 to I-25
- Alternative 4B—Buffered Bus/HOV Lanes from SH 58 on I-70 and I-76 to I-25
- Alternative 4C—Exclusive Two-Way Busways on I-70 from SH 58 to I-25
- Alternative 4E—Two-Way Busway in the Gold Line Alignment from the City of Golden to DUT
- Alternative 4F—Peak Period Busway on West 38th and/or 44th Avenues to DUT
- Alternative 5A—Light Rail Transit (LRT) on the Gold Line from Golden to DUT
- Alternative 5C—LRT from SH 58 on I-70 to DUT
- Alternative 5D—LRT on Arterials (West 38th or 44th Avenue) to DUT
- Alternative 6A—Personal Rapid Transit (PRT)
- Alternative 7A—Commuter Rail on Separate Track on the Gold Line from Golden to DUT
- Alternative 8A—Commuter Rail on Shared Track on the Gold Line from Golden to DUT

The 17 alternatives were evaluated in a matrix format where 10 alternatives were eliminated from further consideration. As shown below, seven alternatives were carried into Detailed Evaluation.

Detailed-Level Alternatives

The seven alternatives carried forward into Detailed Evaluation are listed below:

- Alternative 1—No-Build (NB). No new improvements constructed other than currently committed projects. Same as Conceptual. Cost: no MIS cost.
- Alternative 2—Transportation System Management (TSM). Relatively low cost improvements to the corridor including a new bus program, improvements to the Pecos Street interchange, new Intelligent Transportation System (ITS) measures, improved incident management, and expanded bicycle and pedestrian facilities. Cost: about $62 million.
- Alternative 3B—Highway Widening (HY). Addition of one lane in each direction to I-70 from Wadsworth Boulevard to I-25
for a distance of 4.8 miles. The expanded bus transit program recommended for the TSM alternative is also included. Cost: about $122 million.

- **Alternative 4A — Bus/High Occupancy Vehicle (Bus/HOV).** Addition of one bus/HOV lane in each direction from SH 58 to I-25, including a direct flyover connection to I-25, for a total distance of approximately 10 miles. Cost: about $261 million.

- **Alternative 5C — Light Rail Transit (LRT).** Double-track LRT system from DUT initially to Ward Road (Phase I) and ultimately to the City of Golden (Phase II), a distance of approximately 16 miles for both phases. From DUT, the alignment follows Inca Street to I-70, where the guideway is placed in the I-70 median to Marshall Street. The guideway parallels Marshall Street north to 56th Avenue and west to, and under, Wadsworth Boulevard, then northwest to the Gold Line ROW. From the Gold Line ROW, the alignment travels southeast just west of Tabor Street to the existing Ward Road park-n-Ride, which is the terminus of Phase I. Two alignments are considered for Phase II: the first follows SH 58 to Golden and the second follows the Gold Line to Golden. Service is assumed at 7.5-minute headways at peak period and 15 minutes off-peak. Eight stations are planned for Phase I: DUT, West 38th Avenue, Pecos Street, Federal Boulevard, Sheridan Boulevard, Olde Town Arvada, Ridge Home Arvada, and Ward Road. Two new stations are planned for Phase II: One in the vicinity of McIntyre Street and the other in downtown Golden. The cost for Phase I is estimated at $382 million. The cost for Phase II is about $100 million.

- **Alternative 7A — Commuter Rail with Separate Track (CR/Separate Track).** Single-track DMU system using “Non-Compliant” Federal Railroad Administration (FRA) vehicles from the City of Golden to DUT, a distance of approximately 16 miles. The alignment parallels the Gold Line, then traverses south to Inca Street and east to DUT. Service is assumed at 15-minute headways during the peak period and 30 minutes off-peak. Eight stations are planned: West 38th Avenue, Federal Boulevard, Sheridan Boulevard, Olde Town Arvada, Ridge Home Arvada, Ward Road, 44th/McIntyre, and downtown Golden. Cost: about $281 million.

- **Alternative 8A — Commuter Rail with Shared Track (CR/Shared Track).** Single-track DMU system, using FRA-compliant vehicles from DUT to Golden, a distance of approximately 16 miles. Track would be shared with the existing BN/SF Railroad and upgraded for commuter service. Service is assumed at 20-minute headways during the peak period only, with no off-peak service. Seven stations are planned: West 38th Avenue, Federal Boulevard, Olde Town Arvada, Ridge Home Arvada, Ward Road, West 44th/McIntyre, and downtown Golden. Cost: about $83 million.

The alternatives were evaluated using the RTD Guidance Manual, which is consistent for all four of the MISs currently being conducted by RTD.

### Recommended Locally Preferred Alternative

#### Decision Process

The LPA evaluation and selection process was structured into seven steps:

- **Step 1 — Presentation of the Detailed Evaluation Results to the Citizen’s Task Force (CTF), Technical Advisory Committee (TAC), and Policy Advisory Committee (PAC)**

- **Step 2 — Development of “packages” including the best elements of the alternatives with complementary TSM improvements**

- **Step 3 — Summary evaluation and ranking of the packages**
Step 4 — Short-Listing of LPA Packages with the CTF, TAC, and PAC

Step 5 — Selection of the LPA with the CTF, TAC, and PAC

Step 6 — Presentation of the Draft LPA to the public

Step 7 — Presentation of the Final Recommended LPA to the RTD Board

Presentation of the Detailed Evaluation Results (Step 1)

The results of the Detailed Evaluation were presented to the CTF, TAC, PAC, and RTD Board. The presentations were for information and initial reaction only; no selection of an LPA was expected at that time. However, as a result of the TAC meeting, it was suggested that the project team resurrect the concept of LRT on the Gold Line dismissed during conceptual screening (Alternative 5A). This recommendation was forwarded due to the high cost of placing LRT in the median of I-70.

The project team developed cost and ridership estimates for Alternative 5A. The analysis found that capital costs would be about $100 million lower than Alternative 5C and that year 2020 ridership, at 14,031, would be higher than 5C. Additionally, no significant environmental or community impacts were identified. Consequently, Alternative 5A was carried forward and included as an element of the alternative LPA packages.

Development of LPA Packages (Step 2)

The seven multimodal transportation packages were configured from the best elements of the detailed alternatives. The following packages were presented to the CTF, TAC, and PAC:

- Package 1 — No-Build
- Package 2 — TSM
- Package 3 — Highway Widening (Original Alternative 3B) combined with TSM
- Package 4 — Bus/HOV (original Alternative 4A) combined with TSM
- Package 5A — LRT on the Gold Line from Ward Road to DUT (new alternative developed as a result of the Detailed Evaluation) combined with TSM
- Package 5C — LRT on the Gold Line and I-70 from DUT to Ward Road (original Alternative 5D) combined with TSM
- Package 6 — LRT on the Gold Line from DUT to Ward Road (same as Alternative 5B above) combined with Highway Widening (alternative 3B, Wadsworth to I-25) and TSM

Evaluation and Short-Listing of Alternative Packages (Steps 3 and 4)

The project team evaluated the seven alternative packages and presented the results to the CTF, TAC, and PAC. These groups then ranked the packages, which resulted in a short-listing of concepts.

CTF Actions. The CTF recommended that the following three packages (in order of priority) be carried forward for further evaluation:

- Package 5A — LRT on the Gold Line from DUT to Ward Road (new alternative developed as a result of the Detailed Evaluation) combined with TSM
- Package 6 — LRT on the Gold Line from DUT to Ward Road (same as Alternative 5B above) combined with Highway Widening (similar to 3B, Wadsworth to I-25) and TSM
- Package 5C — LRT on the Gold Line and I-70 from DUT to Ward Road combined with TSM

TAC Actions. The TAC decided not to make a recommendation for the following reasons:

- More time needed to analyze the project team’s recommendation
- More information requested on the project cost and effectiveness numbers and a revised summary evaluation
- Increased committee attendance needed for more input
PAC Actions. After receiving the same presentation given to the CTF and TAC on July 22, 1999, the PAC recommended the alternative packages be reduced to the following two in no order of preference:

■ Package 5A—LRT on the Gold Line from DUT to Ward Road (new alternative developed as a result of the Detailed Evaluation) combined with TSM

■ Package 5C—LRT on the Gold Line and I-70 from DUT to Ward Road combined with TSM

Selection of the Draft LPA
Packages 5A and 5C were presented to the CTF, TAC, and PAC in early September 1999.

The CTF recommended Package 5A as the LPA with the proviso that Package 5C may need to be reconsidered as their recommendation if RTD’s impending “systems analysis” indicated that the ridership projections for Package 5A were much lower than anticipated. The TAC also endorsed Package 5A as the draft LPA. The PAC selected Package 5A as the draft LPA, but requested that Package 5C also be included in the information presented at subsequent public open houses. This was done to allow a final opportunity for public input.

The open houses for the draft LPA confirmed Package 5A as the preferred route noting the following advantages:

■ It has received a high level of support during public meetings and other public involvement activities.

■ It has ridership of 14,031 daily compared to 11,690 users for Package 5C.

■ It is more than $100 million less costly than Package 5C.

■ It represents lower user costs, at $7.98 per new user versus $12.40 for Package 5C.

■ It results in fewer community impacts than the LRT on I-70 alignment.

All three committees agreed that Phase I is the 20-year LPA and Phase II would be implemented after the year 2020. When RTD requests an amendment of the Metro Vision 2020 Plan, it will be for Phase I only.

Summary Description of the LPA
The LPA would involve the construction of double-track LRT from DUT to Ward Road, a distance of about 11 miles. As part of the LPA, it is assumed that Phase II (Ward Road to the City of Golden) would be implemented some time after 2020.

As shown in Figure ES-1, the alignment travels from DUT on an aerial structure across the Consolidated Main Line (CML) and the South Platte River to near I-25. The alignment then passes under I-25 using an existing bike path tunnel and travels across open industrial land north to abandoned railroad ROW entering the Gold Line alignment just to the west of Utah Junction. From this point, the alignment travels in the Gold Line ROW to just west of Tabor Street, then southwest for 0.7 mile across open land to the existing Ward Road park-n-Ride. If the system were eventually extended to the City of Golden as called for with Phase II, alignment would follow either of two routes:

1. SH 58 ROW to Golden
2. Parallel the Gold Line to Golden
Key Elements

Operating Plan

▲ The operating plan assumes 7.5-minute peak weekday and 15-minute off-peak service (30-minute evening). Total travel time is estimated at approximately 23 minutes to Ward Road. Phase I to Ward Road requires a total fleet of 22 light rail vehicles (LRV), including four spare vehicles. The operating plan assumes two-car consists (train sets), with nine operating during peak periods. Phase I operating plans result in 61,600 car LRV hours and 1,290,000 car LRV miles annually.

▲ Phase II is anticipated to require an additional seven LRVs.

Stations

▲ A total of eight new stations are anticipated for Phase I of the LPA including DUT, West 38th Avenue, Pecos Street, Federal Boulevard, Sheridan Boulevard, Olde Town Arvada, Ridge Home Arvada, and Ward Road. If the line were eventually extended to Golden, two additional stations would be added: one in the vicinity of McIntyre Street and one in Golden.

LRT Maintenance Facility

One 10- to 20-acre light maintenance facility would be planned on the alignment. It would be ideally located in the industrial zones between Federal and Sheridan or between Ward Road and McIntyre Street. The following elements would be included:

▲ Tail tracks
▲ Train washing facilities
▲ Maintenance facilities
▲ Outdoor and indoor storage

Bus System Changes

▲ The TSM bus element results in dramatically improved bus service,
especially in the western portions of the study area, where service for local routes has been fortified and stops at LRT stations would be added. skyRide bus service to Denver International Airport (DIA) would be discontinued because access to the airport would be provided by the LRT service on the Gold Line to DUT with a transfer to the East Corridor commuter rail to DIA. LRT service would replace a number of express bus routes, including the 58X, 68X, 72X, and 78X routes originating in the Arvada area. These routes would be replaced with feeder bus routes to the Ward Road, Ridge Home, and Olde Town Arvada stations. Route 164, the Arvada Circulator, would also be provided to support the LRT system. Some improvements are provided in Northwest Denver, but not major changes due to the fact that the current service there is good.

**TSM (Transportation Systems Management) Improvements**

As shown in Figure ES-2, TSM improvements for the LPA include:

- ITS improvements, including variable message signing, on I-70 from SH 58 to I-25 and ramp metering on the eastbound on-ramps of I-70 at Ward Road, Kipling Street, Wadsworth Boulevard, Sheridan Boulevard, Federal Boulevard, and Pecos Street.
- Incident management improvements on I-70 from SH 58 to I-25 including the purchase of a commercial tow-truck vehicle.
- Directional signage improvements at the I-76/I-25 interchange and at the I-70/I-25 interchange.
- Geometric improvements at the Pecos Street/I-70 interchange, including ramp modifications and expansion of acceleration/deceleration (A/D) lanes between Pecos Street and Federal Boulevard.
- Increased bus service throughout the corridor as outlined above.
- Allowance for bicycle and pedestrian improvements.

![Figure ES-2: LPA Proposed TSM Elements I-70 Denver to Golden MTS](image-url)
Costs

The recommended corridor investment (Phase I only) is estimated to have a total capital cost of $316 million, including:

- $280 million for the LRT system
- $40 million for the TSM improvements

This cost is within the corridor budget of $320 million set for the MIS. It should be noted that these costs are in addition to the $149 million recommended in the 2020 Regional Transportation Plan (2020 RTP) for improvements to I-70 and I-76.

The annual operating and maintenance (O&M) cost (Phase I only) is estimated at $18.3 million, including:

- $11.6 million for the LRT system
- $6.7 million for the TSM improvements

Benefits

The investment (Phase I only) would provide a number of transportation benefits to the corridor in the year 2020, including:

- Reducing regional vehicle miles traveled (VMT) by 63,000 per day
- Reducing regional person hours of delay by 8,876 per day
- Serving 14,031 users and increasing transit ridership in the corridor by 12,100 per day

Community Impacts

The recommended corridor investment (Phase I only) is anticipated to require the acquisition of 10 to 20 businesses and 5 to 10 residences. Since the majority of construction would occur in the BN/SF ROW, there would be minimal community impacts other than inconveniences during construction. Approximately 150 homesites are located within 100 feet of the alignment and approximately 325 homesites are located within 300 feet of the alignment.

However, there is the potential for community and neighborhood impacts along the alignment where it parallels Inca Street south of I-25. The specifics of this potential impact cannot be determined until refinements of the alignment during the completion of the PE/DEIS. The construction of elevated structures in the Central Platte Valley for accessing DUT is anticipated to cause some concern regarding visual impacts.

Natural Resource Impacts

Construction of the LPA would disturb approximately 110 to 120 acres (Phase I only). The majority of this acreage is located within the BN/SF ROW and provides no wildlife habitat. There is the potential for impacts to wetlands in the vicinity of Tennyson Street and just to the west of Lowell Boulevard. The construction of stations and the maintenance facility will increase impervious surfaces by approximately 50 acres, resulting in the potential for additional storm water runoff to local watercourses.

Ridership Forecast Update

Ridership forecasts were initially prepared for the LPA in July 1999. Since then, the Denver Regional Council of Governments (DRCOG) has modified the regional land-use data that determines traffic analysis zone (TAZ) trip generation characteristics. RTD has recently prepared a new 2020 travel demand forecast for the Denver to Golden I-70 MIS, using the new DRCOG land-use data.

To summarize, changes in land use, person-trip and transit-trip forecasts are as follows:

Land-Use Forecasts:

- Regional population and employment forecasts are now over 20 percent higher.
- Denver to Golden I-70 population and employment forecasts are now up by 12.9 and 13.1 percent, respectively.
Person-Trip Forecasts:

▼ Person trips generated with the new land-use data are now 23.6 percent higher for the Denver region and 15.2 percent higher for the Denver to Golden I-70 West Corridor.

Transit-Trip Forecasts:

▼ Transit trips have increased slightly for the Denver region. The transit mode share, however, has decreased from 2.7 to 2.3 percent. Much of the new land-use data’s employment growth is in suburban locations where there is less transit service.

▼ Within the Denver to Golden I-70 West Corridor, transit trips and the transit mode share decreased. The corridor’s transit mode share decreased from 2.3 to 2.1 percent.

▼ The resulting impact on Denver to Golden West I-70 LRT ridership was a slight drop in boardings, from 14,031 to 13,577 passenger trips. Downtown Denver is attracting fewer transit trips because of the increased suburban employment forecasts.

Ridership results with the new DRCOG land-use data are described in further detail in the October 21, 2000, paper titled *Documentation of Travel Demand Model Results for the Denver to Golden I-70 West MIS LPA: Old vs. New DRCOG Land Use Data* (Manuel Padron and Associates), which is presented as Appendix B in this document.
SECTION 1
Introduction

This section describes the background of the study, explains the study area, describes the Major Investment Study (MIS) process, and explains the purpose of the report.

Background

The 1997 Guide the Ride Plan presented a long-term vision for rapid transit development in the Denver region. Although the sales tax initiative to fund major components was defeated, the Regional Transportation District (RTD) has continued to use the Guide the Ride Plan as a long-term blueprint for future transit development. The Plan included the rapid transit improvements recommended by completed MISs in the Southeast, West, and East corridors that were subsequently added to the Denver Regional Council of Governments (DRCOG) 2020 Regional Transportation Plan (RTP).

The 1997 Guide the Ride Plan also recommended various levels of transit investment in the North Metro, I-225, and U.S. 36 corridors, but indicated the specific type of improvements would be further analyzed as part of MISs before implementation. In November 1997, the RTD Board of Directors directed staff to conduct an MIS on these three corridors.

The Guide the Ride also recommended Commuter Rail on the Burlington Northern/Santa Fe (BN/SF) railroad alignment (also called the Gold Line) from Denver Union Terminal (DUT) through Arvada to Golden. In April 1998, the Board requested an MIS to be conducted in this corridor.

The region’s planning partners, DRCOG and the Colorado Department of Transportation (CDOT), agreed to participate in these four MISs through representation on each corridor’s Technical Advisory Committee (TAC) and as a member of the Major Investment Study Coordination Committee. The full 15-member RTD Board of Directors and the CDOT Commissioners were members of the Policy Advisory Committees for each of the MIS corridors.

Relationship to the Regional Planning Process

An MIS is essentially a subset of the more comprehensive metropolitan planning process. An MIS identifies the type, design concept, and scope of transportation improvements and results in the selection of a Locally Preferred Alternative (LPA) for a corridor. Upon the endorsement of the MIS studies’ findings by the RTD Board, they will be submitted to DRCOG as requested amendments to the transportation element of Metro Vision 2020, the adopted long-range integrated development and transportation plan for the Denver region.

The next step in the process is the 2020 Regional Transportation Plan (Fiscally Constrained) (2020 RTP). Transportation improvements are incorporated into the RTP to allow programming of funds for the recommended transportation investment. With the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, followed by the Transportation Equity Act for the 21st Century (TEA-21) in 1998, the 2020 RTP is required to be fiscally constrained. That is, only those improvements that can reasonably be expected to be implemented given anticipated funding resources over the Plan period can be included.

The Southeast, East, and West corridors are included in the 2020 RTP. The four current MISs (North Metro Corridor, I-225 Corridor, U.S. 36 Corridor, and I-70 Denver to Golden Corridor) cannot be added to the 2020 RTP.
unless or until additional funding sources are identified.

I-70 Denver to Golden MIS Study Area

Figure 1-1 shows the I-70 Denver to Golden MIS study area. The study area extends from DUT in downtown Denver to the City of Golden, a distance of about 16 miles. The study boundaries extend to I-25 on the east, U.S. 6 in Golden on the west, West 38th Avenue on the south, and the BN/SF Railroad Gold Line alignment on the north. The study area includes portions of the cities of Denver, Wheat Ridge, Lakewood, Mountain View, Lakeside, Arvada, and Golden. Portions of unincorporated Adams and Jefferson counties are also included.

MIS Process

The purpose of an MIS is to examine the transportation needs of a subarea or corridor and to develop and analyze multimodal solutions to meet these needs. The MIS should generate information about the probable impacts and consequences of alternative transportation strategies so that informed decisions can be made regarding transportation investments. The information regarding each alternative should be comprehensive and collectively consider data on costs, benefits, and impacts so that the alternatives can be compared to one another. The MIS process followed by RTD places a high level of emphasis on public involvement. An open, collaborative process that includes an appropriate range of opportunities for input from community and agency groups and the general public is required to ensure that the findings of the MIS will be supported through the implementation process.

The federally mandated metropolitan planning rules state that an MIS shall include:

- A cooperative and collaborative process to establish the range of alternatives to be studied and the factors to be addressed.
- An evaluation of the effectiveness and cost-effectiveness of alternatives in attaining local, state, and national goals and objectives.
- For each alternative, considerations of direct and indirect costs; social, economic, and environmental effects; safety; operating efficiencies; land use and economic development; financing; and energy consumption. The impact of freight movements on mobility in the study area should be incorporated as appropriate.
A proactive public involvement process that provides opportunities for the public and various interests to participate.

Documentation of the consideration given to alternatives and their impacts.

### MIS Coordination

The three regional planning agencies sharing responsibilities for transportation improvements in the Denver region are DRCOG, RTD, and CDOT. When the three previous MISs were completed, the three agencies agreed to conduct these studies simultaneously while sharing management responsibilities. The determination of level of analysis, interagency cooperation, and processes for public involvement were developed based on a collective process including relevant federal agencies, local governments, and the three sponsoring agencies. To assist in that process, the three agencies developed a “Guidance Manual” that established common criteria, methodologies, and procedures for conducting the technical analysis of transportation alternatives.

With the current four MISs sponsored by RTD, the regional planning agencies agreed to continue the coordinated planning approach with CDOT and DRCOG. RTD and its consultants refined the existing RTD Guidance Manual, including updated cost figures, policy and regulatory changes, and additional criteria, as well as other modifications based on the learned experience from the previous process. The I-70, U.S. 36, I-225 and North Metro Corridor Major Investments Studies Guidance Manual for Technical Analysis, November 1999, is the result of that effort and is the planning process document followed by all four corridors.

The MIS coordination effort also included monthly meetings of the four MIS project teams (RTD project director and consultant team project director) as well as representatives from CDOT and DRCOG. These coordination meetings allowed for an exchange of information and discussion of common issues, including revisions to the Guidance Manual. The MIS Coordination Committee also established joint task forces to address technical issues including access to DUT and planning for highway freight movements.

As shown in Figure 1-2, the four MISs followed a four-phase process:

1. **Project Initiation** — to collect relevant information, identify issues, and define the purpose and need for major transportation investments;

2. **Conceptual Screening** — to develop a wide range of candidate solutions to transportation problems and through successively more detailed screening assessments, identify the alternatives that are most promising;

3. **Detailed Evaluation** — to define the final alternatives in detail and to conduct a detailed technical evaluation, thereby providing the technical basis for decisionmaking; and

4. **Project Completion** — to develop agreement on the preferred mix of strategies to be implemented in the corridor and recommend an LPA.

### Decisionmaking Process

To ensure broad-based community input during all phases of the Denver to Golden MIS, RTD used three committees and an active public outreach program to guide the process of making choices among transportation alternatives. The committees included the Citizen’s Task Force (CTF), the Policy Advisory Committee (PAC), and the Technical Advisory Committee (TAC). Through each step in the MIS process, the three committees shared information and recommendations with the project team as they considered the transportation alternatives. The ultimate decision regarding the selection of the Locally Preferred Alternative (LPA) rested with the PAC after receiving input from the CTF, TAC, and the general public.

Section 2 provides more detail on the decisionmaking process.
Purpose of Report

The primary purpose of this Final Report is to document the MIS process and provide detail on the recommended LPA. The results of the three previous phases of the MIS—Project Initiation, Conceptual Screening, and Detailed Evaluation—are also summarized. The detailed data collection, analysis, and results from these previous phases of the study are found in the following reports:

- *O&M Cost Results Report*, July 1999

Organization of this Report

A description of the public involvement process is provided in Section 2. Section 3 explains the existing conditions and explains the purpose and need for improvements. Section 4 describes the development and screening of alternatives. A description of the Detailed Evaluation of alternatives is provided in Section 5. Section 6 presents the decision process used to select the LPA and describes the elements of the LPA.
SECTION 2
Public Involvement Process

This section explains the comprehensive public involvement process included in the I-70 Denver to Golden MIS. The process was comprised of the following elements:

- Advisory Committees
- Neighborhood and Business Outreach
- Low Income and Minority Population Outreach
- Agency Coordination
- Public Meetings and Forums

Advisory Committees

To ensure broad-based community input during all phases of the I-70 Denver to Golden MIS, the study included a committee process for making choices among major investment alternatives. The process involved three committees: the Policy Advisory Committee (PAC), Technical Advisory Committee (TAC), and the Citizen's Task Force (CTF). All three committees met on a similar schedule and were presented similar information. The public involvement structure including the relationship of the three committees is illustrated in Figure 2-1. Although each had defined responsibilities, the CTF and TAC generally acted as advisors to the PAC and, as such, met a week or two earlier so that their input and comments could be taken into consideration at each step in the MIS process (Screening, Detailed Evaluation, LPA selection). The PAC forwarded the decision to the RTD Board in February 2000. The complete membership list for each committee is included in the appendix.

Policy Advisory Committee

The 28-member PAC was comprised of elected officials from the three counties, six municipalities, and the state legislative districts included in the study area, as well as representatives of the Regional Air Quality Council and the CDOT Transportation Commission. RTD Board members representing the study area are also included on the PAC. The committee membership is listed in the appendix. The PAC provided input on public policy concerns and issues related to the project. PAC members participated in the development of the recommended package of improvements. The PAC considered the recommendations of the CTF and TAC, and then recommended a preferred LPA to the RTD Board. The PAC held five meetings over the course of the MIS. Supplementary briefings were provided to individual PAC members as requested.

Technical Advisory Committee

The TAC included 24 transportation planners and engineers from the included jurisdictions and affected transportation agencies. The role of the TAC was to address transportation, land use, and other development issues, and to provide professional advice and evaluations to the PAC. The TAC also made an LPA recommendation to the PAC. The TAC met six times over the course of the MIS.

Citizens Task Force

The CTF included 27 citizens appointed by the city councils or county commissions of the affected jurisdictions. The committee membership is included in the appendix. The intent of the CTF was to provide a structured forum for community input from active and interested citizens in the study area. The CTF acted as a conduit for the PAC to and from the neighborhood and community organizations and other interest groups represented by its membership. The task force held eight meetings that provided the citizen representatives with the opportunity to review issues and provide direction. This committee also made a recommendation on its preference for an LPA to the PAC.
Other Briefings
Additionally, the project team hosted project briefings to the RTD Board, the Jefferson County Commission, DRCOG committees, CDOT Commission, and numerous neighborhood groups.

Neighborhood and Business Outreach
The project team used a variety of techniques to solicit input from neighborhood and business groups at key points in the process as shown in Figure 2-2 and outlined in the following subsections.
Community Leader Interviews
To define the priority community issues to be addressed by the I-70 Denver to Golden MIS, the project team conducted interviews with 24 neighborhood and business leaders and 12 local government officials in the corridor. Input from these meetings was used to identify corridor land use, transportation, and other corridor development issues, and to assist in organizing the public involvement process for the MIS. The CTF was added as a public involvement element based on suggestions from community leaders.

Colorado Motor Carriers (CMC)
To assure consideration of the needs of the trucking industry, RTD hosted a series of workshops with the CMC. The workshops identified deficiencies in the existing highway infrastructure. Alternatives for addressing these concerns were identified. Several recommendations, including improvements to the Pecos Street interchange, signage, and incident management from the workshop were ultimately incorporated in the LPA.
Neighborhood and Business Meetings

The project team made more than 30 presentations throughout the two-year MIS process at civic, neighborhood, and government-sponsored meetings and events. Neighborhood and homeowners groups in the study area were initially identified and contacted. A total of 14 groups within the corridor invited RTD to make presentations, which included slide shows of the corridor alternatives and discussion periods. Similar presentations were also made to nine business and civic groups throughout the corridor, including chambers of commerce, economic development groups, and Kiwanis and Rotary clubs.

The project team made a concerted effort to reach out to citizens who would not otherwise come in contact with the project by attending various community events and festivals. At these events, the project team set up a project booth with a project summary including maps and graphics of the alternatives under consideration. Three of these events—the Northwest Denver Coalition for Better Schools Fair, Fiesta de Mayo, and the Highland Neighborhood Street Fair—are located in North Denver and were targeted for additional public input for environmental justice (EJ) reasons.

Environmental Justice

Areas with significant low-income and/or minority populations were targeted for additional public involvement efforts. MIS guidelines require additional efforts be made to solicit community input from these special populations. The project team made the following outreach efforts within North Denver:

- All 14 North Denver area neighborhood organizations were contacted to explain the project and to offer to make a presentation at their regularly scheduled meetings.
- All North Denver organizations were invited to participate in a Saturday open house workshop.
- The project team attended the three community fairs listed previously.
- All North Denver neighborhood organizations were contacted after the selection of a draft LPA to notify them of the PAC’s recommendation and to offer to make a follow-up presentation at their next regularly scheduled meeting.

The comments and input from the initial outreach effort resulted in the creation of a new light rail alternative during Detailed Evaluation. This alternative was on the Gold Line from Golden to Olde Town Arvada, at which point it went south on the Marshall Street alignment to I-70 and then east into Denver. Although this alternative was developed to better serve North Denver residents, it did not ultimately become the LPA, partially due to opposition from homeowners living close to I-70. This alternative also had lower ridership and higher costs than the LPA.

Public Meetings

General public meeting/open houses were held at three key points in the study process:

1. At project initiation and issues identification;
2. For the conceptual screening results; and
3. To present the draft LPA.

These meetings were announced in the local media with additional local notification by CTF members to their representative organizations. Due to sparse attendance at the first two meetings, a concerted effort was made to increase attendance at the third series of open houses held to present the draft LPA. In addition to meeting notification, advertisements were purchased in eight local newspapers and meeting invitations were sent to more than 30,000 households in the corridor. This higher level of publicity resulted in approximately 200 area residents attending these open houses.
Newsletters and Internet Communication

The four MIS corridors maintained a joint mailing list with 15,500 entries. Newsletters documenting the study process and announcing key meetings were distributed to individuals on the joint mailing list twice during the course of the study. RTD also established an Internet web page for the MIS studies with each project having its own page. The information was updated for each of the four major phases of the MIS process.

Community Issues

Based on the project team’s interviews with corridor stakeholders and initial meetings with neighborhood and business groups, government agencies, and the public at large, the following community, environmental, construction, and transportation issues were identified. These issues provided a basis for defining and evaluating alternatives, and were addressed during the course of the study.

Community/Neighborhood Issues

- Potential impacts on rural character and quality of life, particularly in Wheat Ridge and Fairmont
- Interest in rail options to promote more efficient land use patterns and transit-oriented development, particularly in Arvada and Golden
- Concerns about both rail and highway corridor expansion affecting the character of existing historic neighborhoods
- Concerns that additional rail traffic on the BN/SF Gold Line would be incompatible with adjacent residential development in Arvada and Fairmount
- Fear that an end-of-line rail station near downtown Golden would become a large park-n-Ride
- Concerns that any improvements to I-70 would provide no benefit to Wheat Ridge, but would increase local noise and impact air quality
- Concerns that placing a light rail alternative on arterial streets would increase local traffic and noise, and fragment neighborhoods
- Concern that aerial structures (associated with both LRT and commuter rail) would negatively impact future residential development in the Central Platte Valley in Denver

Transportation Issues

- Coordination with the Colorado Intermountain Fixed Guideway Authority plans for a high-speed rail project from DIA to the mountain communities
- Need for multimodal options and choices, especially to DIA
- Importance of connections to other proposed RTD rail projects including the East, Southeast, and Southwest corridors
- Concern from both highway and rail advocates that all modes and alternatives be given fair consideration
- Need for a better bus system and bus transit service in general, particularly on north-south arterial streets

Finance and Economics

- Concern that the corridor budget will prohibit LRT from fair consideration
- Concerns about commuter rail being a lower cost, less desirable rail option for the corridor
- Concern that corridor planning will be a waste of time due to the lack of funding for recommended improvements

Environmental Issues

- Fear that construction impacts in the I-70 corridor east of Wadsworth Boulevard would generate increased noise and pollution in adjacent neighborhoods and parks
Concern that LRT in the Gold Line right-of-way (ROW) would require the acquisition of adjacent residential homes

Potential impacts of rail alternatives in the Gold Line ROW on Mount Olivet Cemetery operations

Concern that commuter rail in the I-70 ROW would cause significant construction impacts due to travel delays and as a result of the need to widen I-70 east of Wadsworth Boulevard

Potential construction impacts to parks and open space along the I-70 corridor, including the Wheat Ridge Greenbelt along Clear Creek, Berkeley Park, Rocky Mountain Lake Park, and Willis Case Golf Course in Denver

**Construction Issues**

- Cost of retaining walls for highway expansion east of Wadsworth Boulevard to I-25
- Lack of sufficient ROW to fit rail alternatives through the BN/SF rail yards
- Structures and industrial land uses in the I-70 Mousetrap area
- Access to Denver Union Terminal
SECTION 3
Project Initiation

This section describes the existing conditions of the I-70 Denver to Golden Corridor and explains the purpose and need for improvements.

Existing Conditions

Population and Employment

The I-70 Denver to Golden Corridor study area is a diverse area including a balance of housing and jobs. As of 1995, there were an estimated 113,795 residents and 115,205 jobs in the area. Population densities are greatest east of Sheridan in Denver and mostly rural west of Ward Road in unincorporated Jefferson County. The study area population is forecast to grow to 155,016 by 2020, an increase of 36 percent as shown in Table 3-1. Employment is forecast to grow at a similar rate, increasing by 35 percent to 156,081.

<table>
<thead>
<tr>
<th>TABLE 3-1 Study Area Population and Employment Forecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Population</td>
</tr>
<tr>
<td>Employment</td>
</tr>
</tbody>
</table>

Employment within the corridor is concentrated in the extreme eastern and western portions of the study area. The I-25 corridor bisecting the eastern portion of the study area consists of a concentration of warehouse and distribution uses extending to downtown. Just to the west of I-25 are the BN/SF and Union Pacific (UP) railroad yards, including maintenance and intermodal facilities. On the western edge of the study area is the City of Golden, including the Colorado School of Mines, Jefferson County Administrative offices, and the Coors manufacturing facilities, which include brewery and bottling, canning, and porcelain plants. Other areas of employment concentration include:

- The Coors Technology Park and Ball Can plant at West 44th Avenue and McIntyre Street in Jefferson County
- The Denver West Office Park located along I-70 at Denver West Boulevard
- The Arvada Marketplace and adjacent retail development within the Arvada Urban Renewal Area on Wadsworth Boulevard north of I-70

Land-Use Trends

Residential

The eastern and central portions of the study area include largely older, built-out neighborhoods in northwest Denver, Edgewater, Wheat Ridge, and Arvada. The largest undeveloped parcel is the 300-acre Ridge Home property located west of Kipling and north of I-70. This site is bisected by the Gold Line and has been identified by the City of Arvada as having a future potential for transit-oriented development (TOD).

West of Ward Road, the development pattern becomes less dense, and there is a greater amount of undeveloped land in the Fairmont area of unincorporated Jefferson County. Only smaller rural residential developments are expected in this area due to low-density rural residential zoning and the presence of large undevelopable areas including North and South Table Mountain and Mount Olivet Cemetery. On the western edge of the study area, the older residential development pattern is reestablished within the incorporated limits of the City of Golden.

Industrial

In general, future industrial land uses are expected to replicate current trends. The
eastern portion of the study area includes the I-25 highway corridor and the BN/SF and UP rail yards. There is a large amount of associated industrial and warehouse and distribution uses paralleling both the rail and highway corridors. The I-70 corridor has industrial uses along its right-of-way (ROW) from I-25 west to Pecos, after which it becomes primarily residential. There are scattered low-intensity industrial uses in the I-76 and BN/SF Gold Line corridors, diminishing at about Harlan Street.

The I-70 corridor west of Wadsworth Boulevard becomes more commercial in nature with a mix of manufacturing, distribution, and wholesale commercial uses. The largest concentration of industrial uses in the corridor is in central Golden in the Coors manufacturing plants, including the brewery, bottling plant, and porcelain factory with combined employment of greater than 20,000. There are related industrial employment uses in the vicinity of West 44th Avenue and McIntyre Street, including the Coors Technology Park and Ball Container Plant. Coors also has a glass plant just to the south of the Ridge Home property in Wheat Ridge.

Commercial uses diminish to the west until reaching downtown Golden.

Environmental Justice

The highest concentration of minority population is located in Northwest Denver, generally south of I-70, including the Globeville, Sunnyside, and Highland neighborhoods. The greatest concentration of low-income households (more than 50 percent) occurs in the Sunnyside neighborhood near I-70 and I-25. Hidden Lake, Berkeley Gardens, and Arvada Heights neighborhoods show more moderate numbers of low-income households (25 to 50 percent).

The greatest concentration of elderly population in the study area (50 to 75 percent) is found in the Regis neighborhood north of I-70 and west of Sheridan Boulevard. The Hidden Lake, Columbine, North Green Valley, and Applewood Grove neighborhoods show a more moderate concentration of elderly population (25 to 50 percent).

Environmental Constraints

Parks, Open Space, and Cemeteries

As shown on Figure 3-1, the largest parks in the Denver portion of the study area are Berkeley Park, located south of I-70 and west of Sheridan Boulevard, and Rocky Mountain Lake Park, also south of I-70 west of Federal Boulevard. The Willis Case Municipal Golf Course is adjacent to Berkeley Park, on the north side of I-70. In Arvada, the Stenger Soccer Complex and adjacent Harold D. Lutz Sports Complex are located north of the Ridge Home property on the west side of Kipling Street south of West 58th Avenue.

In Jefferson County, the 400-acre Mount Olivet Cemetery is located west of Ward Road and north of West 44th Avenue. The cemetery is bisected east to west by the BN/SF Gold Line. There are numerous smaller neighborhood and community parks located throughout the study area. However, none is located adjacent to any of the alternatives evaluated.
Schools

Figure 3-2 shows some of the larger schools in the area. There are also three institutions of higher education in the area: Colorado School of Mines located in central Golden, Red Rocks Community College, Arvada Campus, located on the Ridge Home property at Ridge Road and Kipling Road, and Regis University located in northwest Denver. The schools closest to the LPA corridor are located in the Olde Town Arvada area, where both Lawrence Elementary School and Shrine to St. Anne School are within one block of the existing rail corridor.

Water Resources

As shown in Figure 3-3, the principal watercourse in the study area is Clear Creek, which travels east from Golden to the South Platte River east of the study area. There are several segments of Clear Creek that could be affected by any of the build alternatives considered for this MIS:

1. Along the Gold Line or the State Highway (SH) 58 corridors from the City of Golden to McIntyre Street
2. Between Wadsworth Boulevard and Marshall Street
3. At the intersection of the BN/SF ROW where the railroad crosses over Clear Creek

There are also several potential conflicts with wetlands as shown in Figure 3-3. Wetlands have been observed north of SH 58 between McIntyre Street and Ward Road and along the riparian corridor of Clear Creek. There are also numerous ditches and gravel pits in the corridors that are anticipated to include wetlands. Wetlands have also been observed near the BN/SF ROW between Tennyson Street and Federal Boulevard. The potential for wetlands impacts is also present between Wadsworth Boulevard and Marshall Street.

Historical Sites

Within the City of Denver, registered historic districts exist in Highlands and West Highlands neighborhoods. Within the City of Arvada, the Olde Town business district and the Grandview Historic District are both within the study area and are adjacent to the LPA alignment. In Golden, two historic districts are within the downtown area.
Hazardous Waste

There are no known “Listed” Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA) hazardous sites near the I-70 or BN/SF ROW. However, the presence of hazardous wastes is possible near any commercial or industrial land uses. Acquisition of any of these properties will require the completion of “Phase 1” site assessment studies to address the potential for hazardous wastes. If the potential is high, a Phase II investigation (actual drilling and laboratory analysis) would be conducted. In addition, it is probable that the BN/SF ROW contains metals and hydrocarbon wastes at concentrations considered to be hazardous.

Transportation Conditions

Major Roadways

I-70, an interstate highway that runs through the center of the region and state, is the focal point of travel in and through the study area. From SH 58 to Kipling Street, I-70 currently has six through lanes, three in each direction. Auxiliary lanes exist between Kipling Street and I-76, essentially making I-70 eight lanes along this segment. I-70 returns to six through lanes from the I-76 junction to I-25. Figure 3-4 illustrates existing lane counts for I-70 and other key roadways in the study area. From SH 58 to Kipling Street, I-70 has a wide median area and ample ROW along either side of the roadway. East of I-76, the median area narrows and the ROW becomes more limited as I-70 passes through established residential, commercial, and industrial areas. In this segment, I-70 is further constrained by public parks that immediately abut the ROW, including Berkeley Park, Rocky Mountain Lake Park, and Willis Case Golf Course. Within the study area, I-70 has 11 interchanges. Included are freeway-to-freeway interchanges with I-76 and I-25 and a partial interchange with SH 58. From west to east the major roadways connecting with I-70 are described below.

SH 58. SH 58 is a four-lane freeway that runs east from U.S. 6 to I-70, connecting the City of Golden to the central portions of the metro area. Daily traffic volumes surpass 22,000 vehicles west of I-70, with no reported hours of severe congestion. Currently, only westbound (I-70) to westbound (SH 58) and eastbound (SH 58) to eastbound (I-70) travel movements are provided.

I-76. I-76 is a four-lane freeway that diverges from I-70 at Wadsworth Boulevard and continues northeast through the Denver metro region and the State of Colorado. Daily I-76 volumes in the study area surpass 35,000 vehicles with no reported hours of severe congestion. I-76 serves as a bypass route by connecting with I-270 for vehicles wishing to avoid the I-70/I-25 interchange (the Mousetrap). Not all movements are currently accommodated at this interchange; only eastbound (I-70) to eastbound (I-76) and westbound (I-76) to westbound (I-70) are provided. Direct access to Wadsworth Boulevard is also provided from I-76.

I-25. I-25 is the major north-south freeway route for the front range of Colorado. Within the study area (I-70 to I-76), I-25 has eight through lanes with daily volumes approaching 190,000 vehicles. Denver Regional Council of Governments (DRCOG) data reports two hours of severe congestion as well as an additional two hours of moderate congestion daily along this segment. The I-70/I-25 Mousetrap interchange is the primary freeway interchange in the Denver metro region. This interchange has been undergoing reconstruction for more than a decade and several more phases are programmed over the 1997-2002 Transportation Improvement Program (TIP) cycle.

East-West Arterials

No east-west arterials run continuously throughout the study area. Partial east-west arterials within the study area include West 32nd Avenue,
West 38th Avenue, West 44th Avenue, West 58th Avenue, and West 64th Avenue. Of these arterials, only West 32nd Avenue and West 44th Avenue (in concert with Ward Road) have interchanges with I-70.

**North-South Arterials**

- Five major north-south arterials cross through the study area. Each arterial is a major north-south route in the Denver metro region roadway system. Information related to these arterials is presented in Table 3-2.

**Other Arterials**

Other north-south arterial streets in the study area with I-70 interchanges are Harlan Street (tight diamond in concert with a frontage road), Lowell Boulevard (half-diamond to/from the east), and Pecos Street (tight diamond).

**I-70 Structure Conditions**

The Colorado Department of Transportation (CDOT) periodically inspects state highway structures and develops a Sufficiency Rating for each, on a scale of 0 to 100, based on structural and functional condition. A structure is rated as structurally deficient (SD) if its physical condition is poor and rehabilitation or replacement is required. A structural rating of functionally obsolete (FO) indicates that roadway widths, vertical or horizontal clearances, or other geometric characteristics are not adequate to accommodate expected demands. Structures with ratings of 50 or less are eligible for state/federal replacement funds, while structures with ratings of 80 or less are eligible for rehabilitation funding.

Table 3-3 shows that of the 23 structures located within the study area, none currently has a rating below 50. Five are rated as structurally deficient. None of these structurally deficient structures is programmed for rehabilitation or replacement in the TIP. Many structures in the corridor were built in the late 1960s, and will be nearing the end of their design life by 2020.
### TABLE 3-2
North-South Arterials in the Study Area

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of Lanes</th>
<th>Daily Volumes (# of vehicles)</th>
<th>Hours of Congestion (severe/moderate)</th>
<th>I-70 Interchange</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Arterials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wadsworth Boulevard</td>
<td>4 from U.S. 6 to I-70 and 6 from I-70 to Ralston Road</td>
<td>72,000 between I-70 and Ralston Road</td>
<td>7/10 between I-70 and Ralston Road</td>
<td>semi-directional design that feeds traffic to/from both I-76 and I-70</td>
</tr>
<tr>
<td>Ward Road</td>
<td>4 from I-70 to Ralston Road</td>
<td>40,000 between I-70 and Ralston Road</td>
<td>3/2 between I-70 and Ralston Road</td>
<td>folded diamond design shared with 44th Avenue</td>
</tr>
<tr>
<td>Kipling Street</td>
<td>4</td>
<td>45,000 between Colfax Avenue and I-70</td>
<td>5/5 between Colfax Avenue and I-70</td>
<td>tight diamond</td>
</tr>
<tr>
<td>Sheridan Boulevard</td>
<td>4</td>
<td>39,000 between Colfax Avenue and I-70</td>
<td>3/1 between I-70 and I-76</td>
<td>only provides movements to/from the east (movements to/from the west are served via frontage roads from/to Harlan); the half-diamond configuration is augmented by a southbound to eastbound loop ramp</td>
</tr>
<tr>
<td>Federal Boulevard</td>
<td>4 from Colfax Avenue to I-76 and I-76</td>
<td>40,000 between I-70 and I-76</td>
<td>3/0 between I-70 and I-76</td>
<td>tight diamond</td>
</tr>
</tbody>
</table>

### TABLE 3-3
I-70 Structure Condition in the I-70 Denver to Golden Study Area (1996)

<table>
<thead>
<tr>
<th>Location/Description</th>
<th>Year Built</th>
<th>Sufficiency Rating</th>
<th>Integrity Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Structures over I-70)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tabor Street @ I-70</td>
<td>1967</td>
<td>72.00</td>
<td>SD</td>
</tr>
<tr>
<td>Federal Boulevard @ I-70</td>
<td>1965</td>
<td>82.10</td>
<td>NO</td>
</tr>
<tr>
<td>Pecos Street @ I-70</td>
<td>1965</td>
<td>90.80</td>
<td>NO</td>
</tr>
<tr>
<td><strong>(I-70 Structures Over)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West 32nd Avenue</td>
<td>1968</td>
<td>89.90</td>
<td>NO (EB), SD(WB)</td>
</tr>
<tr>
<td>Clear Creek</td>
<td>1965</td>
<td>72.80</td>
<td>NO</td>
</tr>
<tr>
<td>West 44th Ave</td>
<td>1968</td>
<td>87.60</td>
<td>NO</td>
</tr>
<tr>
<td>Ward Road</td>
<td>1968</td>
<td>84.20</td>
<td>FO</td>
</tr>
<tr>
<td>Kipling Street WB</td>
<td>1967</td>
<td>69.90</td>
<td>FO</td>
</tr>
<tr>
<td>Kipling Street EB</td>
<td>1967</td>
<td>67.90</td>
<td>SD</td>
</tr>
<tr>
<td>Garrison Street</td>
<td>1967</td>
<td>86.60</td>
<td>NO</td>
</tr>
<tr>
<td>Carr Street</td>
<td>1967</td>
<td>86.60</td>
<td>NO</td>
</tr>
<tr>
<td>Wadsworth Boulevard EB</td>
<td>1967</td>
<td>88.60</td>
<td>SD</td>
</tr>
<tr>
<td>Wadsworth Boulevard WB</td>
<td>1967</td>
<td>69.60</td>
<td>SD</td>
</tr>
<tr>
<td>Clear Creek EB</td>
<td>1967</td>
<td>94.50</td>
<td>NO</td>
</tr>
<tr>
<td>Clear Creek WB</td>
<td>1995</td>
<td>94.50</td>
<td>FO</td>
</tr>
<tr>
<td>Harlan Street</td>
<td>1967</td>
<td>84.70</td>
<td>SD</td>
</tr>
<tr>
<td>Sheridan Boulevard</td>
<td>1966</td>
<td>69.00</td>
<td>FO</td>
</tr>
<tr>
<td>Tennyson Street</td>
<td>1966</td>
<td>71.50</td>
<td>NO</td>
</tr>
<tr>
<td>Lowell Boulevard</td>
<td>1966</td>
<td>66.40</td>
<td>FO</td>
</tr>
<tr>
<td>Zuni Street</td>
<td>1966</td>
<td>85.10</td>
<td>NO</td>
</tr>
<tr>
<td>BN/SF RR, D&amp;RGW</td>
<td>1992</td>
<td>84.00</td>
<td>NO</td>
</tr>
</tbody>
</table>

**Key:**
- SD = Structurally Deficient
- FO = Functionally Obsolete
- NO = Not Structurally Deficient or Functionally Obsolete
- WB = westbound
- EB = eastbound
Traffic Volumes

Figure 3-5 illustrates the traffic count data available for major roadways in the Denver to Golden study area at the time of the project initiation in the Spring of 1998. I-70 carries the highest volume of traffic in the study area, with daily totals of more than 121,000 vehicles in its busiest segment between Kipling Street and Wadsworth Boulevard.

Table 3-4 illustrates the average annual daily traffic volumes at six locations for the years 1975, 1980, 1986, 1990, and 1996. The greatest percentage growth has occurred on I-70 between Ward Road and Kipling Street. Growth in traffic volume is lower east of Wadsworth Boulevard as I-76 has been capturing a portion of the east-west traffic east of Wadsworth Boulevard since its completion.

Table 3-4
I-70 Average Annual Daily Traffic Counts (two-way) by Segment, 1975 to 1996

<table>
<thead>
<tr>
<th>Year</th>
<th>E/O* Ward Road</th>
<th>E/O* Kipling Street</th>
<th>E/O* Kipling Street</th>
<th>E/O* Sheridan Boulevard</th>
<th>E/O* Federal Boulevard</th>
<th>E/O* Pecos Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>39,600</td>
<td>54,100</td>
<td>63,800</td>
<td>75,400</td>
<td>80,200</td>
<td>88,000</td>
</tr>
<tr>
<td>1980</td>
<td>55,400</td>
<td>67,600</td>
<td>79,200</td>
<td>91,000</td>
<td>102,200</td>
<td>107,200</td>
</tr>
<tr>
<td>1986</td>
<td>64,000</td>
<td>81,200</td>
<td>92,400</td>
<td>108,200</td>
<td>113,800</td>
<td>118,400</td>
</tr>
<tr>
<td>1990</td>
<td>73,200</td>
<td>91,000</td>
<td>79,200</td>
<td>94,400</td>
<td>107,400</td>
<td>117,400</td>
</tr>
<tr>
<td>1996</td>
<td>101,800</td>
<td>121,000</td>
<td>91,800</td>
<td>105,200</td>
<td>110,400</td>
<td>110,400</td>
</tr>
<tr>
<td>Average Annual Increase</td>
<td>8%</td>
<td>6%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: DRCOG, CDOT

Note: C-470 at I-70 not operational until 1990

E/O = East of
Table 3-5 shows the number of vehicles by type and their respective percentage of the total vehicles. Single-unit commercial trucks and larger combination-type trucks collectively made up about 6 percent of the vehicle mix as shown.

Traffic Congestion

DRCOG categorizes travel links into three levels of congestion: Uncongested with volume to capacity (v/c) ratios of less than 0.85; Moderate Congestion with v/c ratios of 0.85 to 0.95; and Severe Congestion with v/c ratios over 0.95. Only two segments along I-70 meet the definition of severe congestion—Federal Boulevard to Pecos Street and Pecos Street to I-25—each reporting one-hour per day in the morning peak period. Four segments report with moderate congestion: Kipling Street to Wadsworth Boulevard (three hours), Lowell Boulevard to Federal Boulevard (two hours), Federal Boulevard to Pecos Street (two hours) and Pecos Street to I-25 (one hour).

Accident Statistics

Figure 3-6 shows 1996 accident statistics by major segment as well as how each roadway compares to the 1996 statewide total accident average of 2.13 per million miles of travel. Historically, the highest total accident rates on I-70 in the study area occur between Ward Road and Kipling Street, Federal Boulevard and Pecos Street, and Pecos Street and the I-25 interchange. The total accident rate for the combined segments of I-70 within the study area was higher than the statewide average in each of the five years examined. There were 19 fatal accidents in the I-70 corridor within the study area between 1992 and 1996. Off of I-70, the highest accident levels were found on Federal and Kipling boulevards south of I-70 and on Ward Road and Wadsworth Boulevard north of I-70.

Traffic Volume Forecasts

Figure 3-7 shows projected 2020 two-way traffic volumes for freeways and major arterials in the study area assuming no improvements to facilities. The segment of I-70 between Kipling Street and Wadsworth Boulevard is projected to carry the largest 2020 two-way volume (158,500) in the study area. The greatest percentage growth in the study area is forecast to occur on I-76 north of I-70 with a 92 percent growth in volume, and I-76 west of I-25 with a 140 percent increase in volume. Wadsworth Boulevard north of I-70 will continue to carry the highest 2020 volume of traffic on arterial roadways in the study area (96,200).

Existing Transit Service

The Regional Transportation District (RTD) is the public transit operator in the Denver region. The RTD bus transportation network is a regional system that serves most of the areas in the study area. A description of these facilities is provided below.

| TABLE 3-5 |
| I-70 Vehicle Classification |
| Denver to Golden Study Area |

<table>
<thead>
<tr>
<th>Vehicle Classification</th>
<th>Passenger Cars and Pickups</th>
<th>Single-Unit Trucks</th>
<th>Combination Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Count</td>
<td>94,077</td>
<td>2,926</td>
<td>3,092</td>
</tr>
<tr>
<td>% of Total</td>
<td>93.99</td>
<td>2.92</td>
<td>3.09</td>
</tr>
</tbody>
</table>

Source: CDOT Classification Count East of Sheridan Boulevard (June 24, 1994)
park-n-Ride Facilities

Two park-n-Ride facilities are located in the I-70 Denver to Golden Corridor. The Olde Town park-n-Ride is located at Wadsworth Boulevard and Grandview Avenue near downtown Arvada. This facility has 200 spaces and was 81 percent utilized from June to November 1999. Four local, three express, and two regional routes serve this facility. The Ward Road park-n-Ride is located at I-70 and Ward Road. This facility has 228 parking spaces and was 83 percent utilized from June to November 1999. One local, one limited, two express, and one regional route serve this facility. Table 3-6 summarizes several attributes for each facility including the number of parking spaces, utilization statistics, transit services, and other characteristics. RTD operates one transit center in the corridor – at Applewood Village Shopping Center. The facility is located on the west side of the shopping center at West 38th Avenue. Routes 28, 32, 38, 38L, 44, and 125 serve this facility.

TABLE 3-6
I-70 West Transit Facilities

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Parking Spaces</th>
<th>Average Utilization</th>
<th>Utilization Rate</th>
<th>Bus Routes Serving</th>
<th>Bicycle Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olde Town park-n-Ride</td>
<td>Wadsworth Boulevard and Grandview</td>
<td>200</td>
<td>161</td>
<td>81%</td>
<td>Local: 52, 64, 72, 76; Express: 68X, 75X, 76X; Regional: CC, AA</td>
<td>4 spaces</td>
</tr>
<tr>
<td>Ward Road park-n-Ride</td>
<td>Ward Road and I-70</td>
<td>228</td>
<td>189</td>
<td>83%</td>
<td>Local: 17, 44L; Express: 6X, 72X; Regional: AA</td>
<td>6 spaces</td>
</tr>
<tr>
<td>Applewood Transfer Station</td>
<td>West 38th Avenue and Youngfield Street</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Local: 28, 32, 38, 44, 125; Express: None; Regional: None</td>
<td>None</td>
</tr>
</tbody>
</table>

Notes:
Bus route service and bicycle facility information obtained from RTD 1997 Facilities and Properties Reference Book.

Corridor Bus Routes

RTD provides service in the I-70 Denver to Golden Corridor through a network of regional, express, and local bus routes. Following are brief descriptions of West I-70 bus routes. Table 3-7 lists the corridor bus routes, service levels, and operational characteristics. This table does not include Colfax and U.S. 6 routes that operate in only a small portion of the corridor (e.g., Routes 16 and 125).

Regional Routes

RTD operates two regional routes in the I-70 Denver to Golden Corridor. Route G provides service from Boulder to the Denver Federal Center, adjacent to the RTD Cold Springs park-n-Ride. This route crosses the study area through Golden. Route G operates primarily in the peak periods (both directions) on Monday through Friday at varying service frequencies. Route CC provides service from Wondervu and Coal Creek Canyon to the Olde Town park-n-Ride in Arvada. This route operates primarily in the peak periods (both directions on Monday through Friday at varying service frequencies).
**TABLE 3-7**
RTD Bus Routes and Service Characteristics (1999)
Denver to Golden Study Area

<table>
<thead>
<tr>
<th>Category/Route</th>
<th>Hours of Operation Weekday</th>
<th>Peak-Period Headways (min.)</th>
<th>Off-Peak Headways (min.)</th>
<th>Avg. Weekday Ridership</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-S Routes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 – E. 6th Ave./N. Pecos</td>
<td>4:58 a.m.—11:24 p.m.</td>
<td>30</td>
<td>20</td>
<td>3,410</td>
</tr>
<tr>
<td>31-North Federal</td>
<td>5:11 a.m.—1:49 a.m.</td>
<td>15</td>
<td>30</td>
<td>2,079</td>
</tr>
<tr>
<td>51-Sheridan Crosstown</td>
<td>one p.m. run—2:45</td>
<td>n/a</td>
<td>n/a</td>
<td>10</td>
</tr>
<tr>
<td>64-Arvada/Olde Town</td>
<td>5:27 a.m.—11:41 p.m.</td>
<td>15</td>
<td>15</td>
<td>3,537</td>
</tr>
<tr>
<td>76-Wadsworth Crosstown</td>
<td>6:03 a.m.—6:03 p.m.</td>
<td>30</td>
<td>60</td>
<td>1,182</td>
</tr>
<tr>
<td>100-Kipling Crosstown</td>
<td>6:06 a.m.—6:06 p.m.</td>
<td>30</td>
<td>60</td>
<td>199</td>
</tr>
<tr>
<td>125-Denver West Crosstown</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-W Routes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-Jeffco</td>
<td>5:50 a.m.—12:28 p.m.</td>
<td>30</td>
<td>30</td>
<td>879</td>
</tr>
<tr>
<td>32-32nd Avenue</td>
<td>6:03 a.m.—12:17 a.m.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38-West 38th Avenue</td>
<td>4:52 a.m.—12:52 a.m.</td>
<td>30</td>
<td>30</td>
<td>2,109</td>
</tr>
<tr>
<td>44-44th Ave/W. 44th Avenue</td>
<td>4:45 a.m.—12:02 a.m.</td>
<td>20</td>
<td>30</td>
<td>3,924</td>
</tr>
<tr>
<td>52-W. 52nd Avenue/S. Pearl</td>
<td>5:19 a.m.—10:31 p.m.</td>
<td>30</td>
<td>30</td>
<td>4,085</td>
</tr>
<tr>
<td>72-72nd Avenue Crosstown</td>
<td>5:29 a.m.—8:52 p.m.</td>
<td>15</td>
<td>30</td>
<td>3,139</td>
</tr>
<tr>
<td><strong>Limited Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 Ltd.-Downtown-Golden</td>
<td>5:49—7:51 a.m.</td>
<td>30</td>
<td>n/a</td>
<td>152</td>
</tr>
<tr>
<td>38 Ltd.-Downtown- Applewood Village</td>
<td>4:04—6:19 p.m.</td>
<td>30</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td><strong>Regional Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-Coal Creek to Arvada</td>
<td>5:39 a.m.—5:24 p.m.</td>
<td>60</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>G-Boulder to Federal Center</td>
<td>6:33 a.m.—6:53 p.m.</td>
<td>30</td>
<td>n/a</td>
<td>253</td>
</tr>
<tr>
<td><strong>skyRide Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA-DIA/Arvada</td>
<td>3:21 a.m.—10:22 p.m.</td>
<td>60</td>
<td>60</td>
<td>482</td>
</tr>
<tr>
<td><strong>Express Service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6X-Ward Road park-n-Ride-DTC</td>
<td>5:51—8:26 a.m.</td>
<td>30</td>
<td>n/a</td>
<td>159</td>
</tr>
<tr>
<td>58X-Ralston-Downtown</td>
<td>5:56—7:48 a.m.</td>
<td>30</td>
<td>n/a</td>
<td>131</td>
</tr>
<tr>
<td>68X-North Pierce Express</td>
<td>6:06—8:18 a.m.</td>
<td>30</td>
<td>n/a</td>
<td>83</td>
</tr>
<tr>
<td>72X-West Arvada- Downtown</td>
<td>5:59—7:45 a.m.</td>
<td>30</td>
<td>n/a</td>
<td>203</td>
</tr>
<tr>
<td>75X-Olde Town-Martin</td>
<td>5:34 a.m.—6:05 p.m.</td>
<td>one run each direction</td>
<td>n/a</td>
<td>51</td>
</tr>
<tr>
<td>76X-North Wadsworth Express</td>
<td>6:06—8:18 a.m.</td>
<td>30</td>
<td></td>
<td>169</td>
</tr>
</tbody>
</table>

**Express Routes**

Six express routes operate in the West I-70 corridor. All routes operate exclusively in the peak period. Four of the six routes provide service to/from Market Street Station in downtown Denver. Route 6X (Ward Road/Cold Springs park-n-Ride/the Denver Tech Express) provides
service from the Ward Road park-n-Ride to the Denver Tech Center. This route stops at the Cold Spring park-n-Ride on U.S. 6 on its way to/from the Denver Tech Center. Route 6X operates in the peak period, peak direction, with four trips in each peak period.

Route 58X (West 58th Express) provides service from Ralston/West 60th in Arvada to downtown Denver. This route does not stop at any park-n-Ride lots. In the a.m. peak period, routing to downtown is I-70 east to I-76 east to I-25 south. The route operates in the I-25 bus/high occupancy vehicle (HOV) lane and the DUT busway to Market Street Station. In the p.m. peak period, routing to Arvada is I-25 north to I-70 west. The route does not operate in the bus/HOV lane in the p.m. peak period. Route 58X operates in the peak period, peak direction, with three trips in each peak period.

Route 68X (North Pierce Express) operates from Pierce/West 80th in Arvada to downtown Denver with a stop at the Olde Town park-n-Ride. In the a.m. peak period, routing to downtown is I-70 east to I-76 east to I-25 south. The route operates in the I-25 bus/HOV lane and the DUT busway to Market Street Station. In the p.m. peak period, routing to Arvada is I-25 north to I-70 west. The route does not operate in the bus/HOV lane in the p.m. peak period. Route 68X operates in the peak period, peak direction, with two trips in each peak period.

Route 72X (Ward Road Express) operates from Quaker/West Woods Circle in Arvada to downtown Denver with a stop at the Ward Road park-n-Ride. In the a.m. peak period, routing to downtown is I-70 east to I-76 east to I-25 south. The route operates in the I-25 bus/HOV lane and the DUT busway to Market Street Station. In the p.m. peak period, routing to Arvada is I-25 north to I-70 west. The route does not operate in the bus/HOV lane in the p.m. peak period. Route 72X operates in the peak period, peak direction, with six trips in each peak period. A few trips begin/end at the Ward Road park-n-Ride.

Route 75X (Olde Town/Martin Waterton Express) provides service from the Olde Town park-n-Ride in Arvada to the Lockheed Martin Waterton Plant south of C-470. Routing is via Wadsworth Boulevard. The route makes one a.m. and one p.m. peak period trip.

Route 76X (North Wadsworth Express) operates from West 92nd/Wadsworth in Arvada to downtown Denver with a stop at the Olde Town park-n-Ride. In the a.m. peak period, routing to downtown is I-70 east to I-76 east to I-25 south. The route operates in the I-25 bus/HOV lane and the DUT busway to Market Street Station. In the p.m. peak period, routing to Arvada is I-25 north to I-70 west. The route does not operate in the bus/HOV lane in the p.m. peak period. Route 76X operates in the peak period, peak direction, with four trips in each peak period.

Overall, RTD’s express route system provides six peak period, peak direction trips between the Ward Road park-n-Ride and downtown Denver, and six peak period, peak direction trips between the Olde Town park-n-Ride and downtown Denver.

Local Routes
North-south local routes in the corridor include 6 (East 6th Avenue/North Pecos), 31 (North Federal), 51 (Sheridan Crosstown), 76 (Wadsworth Crosstown) and 100 (Kipling Crosstown). Route 76 provides service to the Olde Town park-n-Ride. Route 31 operates at 15-minute service frequencies in the peak period, with every other trip going to either the Westminster Center park-n-Ride or Front Range Community College. Route 76 also operates at 15-minute service frequencies all day. The other north-south local routes generally operate at 30-minute service frequencies.

East-west local routes in the corridor include 17 (Jeffco), 72 (72nd Avenue Crosstown), 52 (West 52nd Avenue/South Pearl), 44 (West 44th Avenue), 38 (West 38th Avenue), and 32 (West 32nd Avenue). Route 72 provides service to the Olde Town park-n-Ride. Route 17 provides service to the Ward Road park-n-Ride. Routes 17, 32, 38, and 44 provide service to the Applewood Village transit center. Route 52 operates at approximate 15-minute service frequencies in the peak period, peak direction, and 30-minute service frequencies at other
times. All other east-west routes generally operate at 30-minute all-day service frequencies.

In addition to the above-noted routes, Route 64 is a circulator route in Arvada that makes one p.m. peak period trip.

**Limited Routes**

The corridor has two limited stop routes. Route 44 Limited provides supplemental peak period service along Route 44’s alignment. Route 44 Limited makes three to four peak direction trips in each peak period. Route 38 Limited provides supplemental peak period service along Route 38’s alignment. Route 38 Limited makes two peak direction trips in each peak period.

**skyRide**

RTD operates one skyRide route in the corridor. Route AA provides service from the Ward Road and Olde Town park-n-Rides to Denver International Airport (DIA). This route operates at 60-minute service frequencies. It also stops at the Thornton park-n-Ride and Wagon Road park-n-Ride in addition to select stops on East 104th on its way to/from DIA.

**Ridership Characteristics**

I-70 Denver to Golden Corridor ridership characteristics were determined with RTD farebox and ridecheck data. Average weekday ridership is presented by route in Table 3-7. This table also provides an indication of route productivity in terms of riders per bus trip and riders per service-hour.

Ridership characteristics were also reviewed at the Olde Town and Ward Road park-n-Rides. Specifically, RTD ridecheck data were used to determine boarding and alighting characteristics for all routes at each park-n-Ride. It is important to note that some of the ridecheck data date back to July 1995. Thus, ridership characteristics may have changed somewhat. Furthermore, ridecheck counts may not include all bus trips for the specified route. Figures 3-8 and 3-9 illustrate boarding and alighting activity by route. Significant findings are as follow:

- **Route 76** has the highest level of passenger boarding and alighting activity at the Olde Town park-n-Ride, followed by Route 52. It is not possible to tell if Routes 52 and 76 are being used as feeder routes to transfer to the park-n-Ride’s express and regional routes, or if Routes 52 and 76 are being used as destination routes, with passengers driving to the park-n-Ride to board these routes.

- **Route 76X** is the highest utilized express route at the Olde Town park-n-Ride, with 72 daily boardings. Approximately 40 percent of Route 76X’s total boardings occur at the Olde Town park-n-Ride.

- **Approximately 16 percent of Route AA’s total boardings** occur at the two corridor park-n-Rides, with 10 percent occurring at Olde Town and 6 percent occurring at Ward Road.

Table 3-8 presents passenger boarding and alighting data by route for the two corridor park-n-Rides.

**Carpool/Vanpool Facilities and Services**

Carpool and vanpool services offer groups of commuters an avenue to coordinate their travel and transportation needs. DRCOGs RideArrangers provides carpool matching services and assists in the development and maintenance of vanpool services. Currently, no vanpools service the study area.
Figure 3-8
Passenger Boarding/Alighting Activity at Olde Town park-n-Ride
I-70 Denver to Golden MIS

Source: Manuel Padron & Associates 1999

Figure 3-9
Passenger Boarding/Alighting Activity at Ward Road park-n-Ride
I-70 Denver to Golden MIS

Source: Manuel Padron & Associates 1999


### Railroad Facilities

Railroad operations in the study area typically serve freight purposes for both interstate and intrastate activities. Figure 3-10 shows railroad lines in the study area. The railroad line of most interest to the study area is the old Colorado and Southern line now operated by BN/SF, which runs from Golden to the major yard complex near West 58th Avenue and Pecos Street. From Sheridan Boulevard to the yard, the alignment is shared with UP’s Moffat line. In recent years, the BN/SF line has been the object of discussion regarding potential passenger rail service by RTD (the Gold Line route). Preliminary investigations by RTD revealed some willingness on the part of BN/SF to discuss potential rail service along this alignment. The *Colorado Passenger Rail Study* (1996) noted that the overall condition of this track for passenger rail service was poor. The study also noted that this rail line currently operates four to five freight service trains daily with maximum speeds of approximately 25 miles per hour. The Coors complex in Golden is the primary origin/destination of this train.

In the east portion of the study area, several BN/SF and UP lines join and extend south to the consolidated main line in the Platte valley. BN/SF operates a large intermodal rail facility in this area (generally bounded by Pecos Street and I-25, West 58th Avenue, and West 48th Avenue). This facility is a major intermodal hub in the Denver region, with proximity to several major interregional and intraregional highway facilities (I-25, I-70, and I-76).

### Bicycle and Trail System

Figure 3-11 illustrates the existing and proposed bicycle and pedestrian trails within the I-70 Denver to Golden Corridor. These trail corridors should promote travel within and outside county boundaries, provide local access to activity centers and/or other public places, connect to rapid transit stations such as

---

**TABLE 3-8**

Ridership Characteristics at I-70 West park-n-Rides (1999)

<table>
<thead>
<tr>
<th>Route Type</th>
<th>Route Type</th>
<th>Eastbound/Southbound</th>
<th>Westbound/Northbound</th>
<th>Total Route</th>
<th>% of Route</th>
<th>Total Boardings</th>
<th>Boardings at p-n-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olde Town</td>
<td>Local</td>
<td>52</td>
<td>73</td>
<td>110</td>
<td>113</td>
<td>3,205</td>
<td>3.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>64</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>7</td>
<td>14.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>72</td>
<td>36</td>
<td>10</td>
<td>22</td>
<td>46</td>
<td>9.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76</td>
<td>105</td>
<td>107</td>
<td>77</td>
<td>212</td>
<td>5.1%</td>
</tr>
<tr>
<td>Express</td>
<td>68X</td>
<td>27</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>29.0%</td>
</tr>
<tr>
<td></td>
<td>75X</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>11.4%</td>
</tr>
<tr>
<td></td>
<td>76X</td>
<td>72</td>
<td>0</td>
<td>61</td>
<td>72</td>
<td>61</td>
<td>39.1%</td>
</tr>
<tr>
<td>Regional</td>
<td>CC</td>
<td>0</td>
<td>10</td>
<td>7</td>
<td>10</td>
<td>17</td>
<td>8.4%</td>
</tr>
<tr>
<td>skyRide</td>
<td>AA</td>
<td>26</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td>32</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>344</td>
<td>125</td>
<td>161</td>
<td>282</td>
<td>505</td>
<td>N/A</td>
</tr>
<tr>
<td>Ward Road</td>
<td>Local</td>
<td>17</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1.2%</td>
</tr>
<tr>
<td></td>
<td>44Ltd</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.4%</td>
</tr>
<tr>
<td>Express</td>
<td>6X</td>
<td>12</td>
<td>0</td>
<td>7</td>
<td>12</td>
<td>19</td>
<td>9.9%</td>
</tr>
<tr>
<td></td>
<td>72X</td>
<td>22</td>
<td>1</td>
<td>22</td>
<td>22</td>
<td>44</td>
<td>15.2%</td>
</tr>
<tr>
<td>skyRide</td>
<td>AA</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td>30</td>
<td>5.8%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>65</td>
<td>3</td>
<td>0</td>
<td>58</td>
<td>65</td>
<td>N/A</td>
</tr>
</tbody>
</table>

---

**DEN/CA2333/993560011.DOC 3-16**
Figure 3-10
Railroad Lines in the Study Area
I-70 Denver to Golden MIS

Figure 3-11
Existing and Proposed Bike and Pedestrian Trails
I-70 Denver to Golden MIS

Sources: DRCOG

DEN/9/147381.A6.01/Figure3-10/10/00

DEN/9/147381.A7.01/Figure3-11/10/00
park-n-Ride terminals, and meet DRCOG’s TIP criteria for federal funding eligibility (Jefferson Countywide Transportation Plan). Specifically, the current system uses existing roadway corridors. The Clear Creek trail, for example, is a major east-west trail generally following SH 58, I-70, and I-76. Just north of I-70, the Ralston Creek trail runs east-west joining the Clear Creek Trail near I-76. Combined with several north-south segments, the trail system attempts to build an interregional network.

Summary Purpose and Need

Transportation Need

Travel in the I-70 Denver to Golden study area is characterized by high volumes of east-west traffic on I-70 and I-76, and on the principal north-south arterials including Ward Road, Kipling Parkway, and Wadsworth, Sheridan and Federal Boulevards. Average traffic volumes on I-70 exceed 100,000 vehicles a day for most of the length of the study area. The exception is at Harlan, where average daily traffic (ADT) drops to 78,000 as more than 50,000 vehicles divert onto I-76 heading to the northwest. The highest north-south traffic volumes are on Wadsworth Boulevard with 72,000 ADT to the north of I-70.

I-70 serves multiple travel markets including the following:

- Interstate and regional intrastate commercial vehicle operations
- Interstate and intrastate general and recreational travel
- Commuter movements from mountain communities and western suburbs to eastern and southeastern metropolitan employment centers including the Southeast Corridor (Denver Technological Center) and DIA
- Commuter movements from mountain communities and western suburbs to downtown Denver
- Trips internal to the study area

East-west travel demonstrates suburb-to-central city characteristics, with higher eastbound volumes in the morning peak period and higher westbound volumes in the evening peak period. Travel volumes on the north-south arterial facilities are relatively balanced throughout the day. Suburb-to-suburb travel is increasing as the size of the metropolitan area is increasing.

Metropolitan population and employment growth have resulted in traffic volume increases of from 49 to 59 percent on I-70 west of Wadsworth Boulevard from 1986 to 1996. To the east of Wadsworth Boulevard, overall east-west traffic volumes have increased by a comparable amount, but the volume on I-70 has declined slightly due to the opening of I-76. Generally comparable traffic volume increases have occurred on the north-south arterials from Wadsworth Boulevard west.

As a result of continued forecast population and employment growth in the study area compounded with overall growth in the larger metropolitan region using the major interstate facilities, congestion on I-70 is expected to increase without major investments in transportation capacity. ADT is forecast to increase on I-70 from 20 to 45 percent over the 1996 to 2020 time period, with peak volumes of 158,500 just west of Wadsworth Boulevard. Severe traffic congestion (defined as a volume to capacity ratio of 0.95 or greater) is forecast to increase to 3 hours a day east of Sheridan Boulevard.

I-76 ADT is forecast to increase from 51,400 to 98,400 by 2020. Wadsworth Boulevard is also forecast to carry over 96,000 trips per day at the I-70 intersection by 2020. Other north-south arterials are also forecast to grow by comparable amounts (20 to 41 percent) over the next 20 years.

There are also safety deficiencies in the study area. I-70 has substandard shoulders and interchange ramp geometry. Many of the bridge structures date from the 1960s and are structurally deficient or functionally obsolete. Accident counts exceed the statewide interstate average on most of I-70 and exceed the metropolitan arterial average by a factor of
two or more on segments of each of the major north-south arterials.

Existing transit service in the study area is characterized by strong ridership on east-west local routes. Routes 32, 38, 44, and 52 providing downtown service from the study area all have high ridership levels. The study area has inadequate north-south service with the need for additional service on Kipling Street (Route 100) and a projected need for service on Ward Road. There are also lower levels of express bus service in the I-70 Denver to Golden Corridor as compared to other travel corridors. There are only six existing express bus routes (6X, 58X, 68X, 72X, 75X, and 76X). Routes 76X and 52X have the highest ridership levels, with the greatest levels of boardings taking place at the Ward Road and Olde Town park-n-Rides.
This section describes the process for developing initial alternatives and the Screening-Level Evaluation.

**Development of Alternatives**

The development of initial alternatives, as shown below in Figure 4-1, is an important step in the planning process. The alternatives must be structured to provide the public, public officials, other participating agencies, and corridor stakeholders with the necessary information to test community values and initiate the alternatives refinement process. The intent is to allow a sufficient range of tradeoffs to be presented so that the affected public understands a broad range of consequences. The MIS process requires consistency with the following guiding principles:

- The alternatives should respond directly to a purpose and need.
- Alternatives should be developed with a methodology that assures that all reasonable options have been considered.
- A sufficient range of alternatives needs to be developed to test local values and to provide a distinctive set of tradeoffs among costs, benefits, and impacts.
- Each alternative should be configured to make it as competitive as possible.
- Community support is critical to a successful major investment for mobility improvement.

Based on these guiding principles, the project team developed the initial list of alternatives using the following six steps:

**Step 1** — Review of past studies conducted in the corridor

**Step 2** — Review of the DRCOG 2020 RTP, Transportation Improvement Program (TIP), and consideration of transportation needs

**Step 3** — Consideration of community transportation and land-use goals and objectives

**Step 4** — Workshop to Develop Initial Alternatives to the Public at Open Houses and Other Forums

**Step 5** — Present Alternatives to TAC, CTF, PAC

**Step 6** — Review of past studies conducted in the corridor

![Figure 4-1](DEN\147381.A7.61\Figure4-1\10_00)

*Figure 4-1
Development of Initial Alternatives
I-70 Denver to Golden MIS*
Step 4 — Project team workshop to develop an initial list of alternatives, based on all considerations

Step 5 — Presentation of master list of alternatives to the public at open houses and other forums

Step 6 — Presentation of the master list of alternatives to the CTF, TAC, PAC, and the public for additions and modifications

Description of Screening-Level Alternatives

The Screening-Level Alternatives are organized by mode:

1.0 Series — No-Build (NB)
2.0 Series — Transportation System Management/(TSM)
3.0 Series — Highway alternatives
4.0 Series — Bus/high occupancy vehicle (HOV) alternatives
5.0 Series — Light Rail Technology (LRT) alternatives
6.0 Series — Advanced/emerging technologies
7.0 Series — Commuter Rail (CR) alternatives using Diesel Multiple Unit (DMU) Technology
8.0 Series — Conventional commuter rail alternatives using Federal Railroad Administration (FRA)-compliant technology

1.0 No-Build Alternative

The No-Build Alternative included the existing transportation network as well as committed (TIP) transportation projects with identified funding within the corridor. Outside the corridor, it assumed implementation of the DRCOG 2020 RTP. The Southeast and West LRT lines and the East Corridor commuter rail/DMU line to DIA were included in the No-Build network.

2.0 Transportation System Management Alternative

For screening, this alternative included generally lower cost improvements designed to increase the efficiency of the existing transportation system. Both transit and roadway improvements were included, as well as incentives to reduce individual travel. The following elements were included in the TSM alternative at the screening phase:

Roadway Improvements

- Conversion of existing I-70 shoulders to flexlanes (travel lanes to be used only during rush hour) at designated pinch points (assumes minimal new construction), or as an alternate, the inclusion of a “high-tech” platform from Wadsworth Boulevard to I-25
- Improvements at selected I-70 interchanges

Transportation Operational Improvements

Intelligent Transportation Systems (ITS); additional signage; more park-n-Ride facilities; improved bus service; safety improvements; incident management improvements (quicker response time for accident clearance and emergency assistance); and priority treatments for buses such as special ramps, etc., were included for the screening evaluation.

3.0 Highway Alternatives

As shown in Figure 4-2, four highway improvement alternatives were considered during screening:

- Alternative 3A — Add Two Lanes on I-70 from SH 58 to I-76 — This alternative involved expanding I-70 from 6 to 8 lanes from SH 58 to I-76, a distance of about 5 miles, as recommended in the 2020 RTP. This alternative was initially considered as one of the conceptual alternatives but later incorporated as part of the No-Build Alternative.
Alternative 3B—Add Two lanes on I-70 from Wadsworth Boulevard to I-25—This alternative involved expanding I-70 from 6 to 8 lanes from Wadsworth Boulevard to I-25, a distance of 4.6 miles. This alternative also assumed 12-foot travel lanes, with 12-foot inside and outside shoulders.

Alternative 3C—Add Two lanes on I-76 from I-70 to I-25—This alternative involved expanding I-76 from 4 to 6 lanes as recommended in the 2020 RTP. This alternative was initially considered as one of the conceptual alternatives but later incorporated as part of the No-Build Alternative.

Alternative 3E—High-Tech Platforms with Moveable Barriers from Wadsworth Boulevard to I-25—This alternative involved using moveable barriers in the middle of I-70 to increase the capacity of the highway from three to four lanes in the peak direction. In the morning, eastbound commuters would use four lanes. In the afternoon rush hour, the barrier moves over, increasing the westbound lanes from three to four lanes wide. This switch would occur Monday through Friday.

4.0 Bus/HOV Alternatives

As shown in Figure 4-3, five Bus/HOV alternatives were considered during screening:

Alternative 4A—Buffered Bus/HOV Lanes on I-70 from SH 58 to I-25—This alternative involved adding one Bus/HOV lane in each direction from SH 58 to I-25, a distance of 9 miles. Design standards assumed a 4-foot buffer between the Bus/HOV lanes and the 12-foot general-purpose lanes. A flyover connection from the I-70 HOV lanes to the I-25 HOV lanes was included.
Alternative 4B—Buffered Bus/HOV Lanes on I-70 from SH 58 to I-76 and from I-76 to I-25—This alternative involved adding one buffered Bus/HOV lane in each direction from SH 58 to I-76 and on I-76 to I-25 and then down I-25 to DUT. Design standards assumed a 4-foot buffer between the Bus/HOV lanes and the 12-foot general-purpose lanes. The total widening would be 32 feet and would occur in the median to minimize impacts. A flyover connection from the I-76 HOV lanes to the I-25 HOV lanes is included. From this point, the existing Bus/HOV lanes on I-25 would be used to Denver Union Terminal (DUT) in lower downtown Denver.

Alternative 4C—Exclusive Two-Way Busway on I-70—This alternative is similar to 4A except that the additional lanes are barrier-separated for buses only. A 40-foot envelope would be required. No carpools would be allowed in these lanes. Travel would be one-way reversible with barrier separation left and right. Gating is planned at periodic locations. Flyover connections would be required at station locations. A direct flyover connection between I-70 and I-25 is included.

Alternative 4E—Two-Way Busway on the Gold Line Right-of-Way—This alternative assumed construction of a new two-lane busway next to the Gold Line railroad alignment, which runs between the DUT and Golden. Two 12-foot lanes with a 2-foot median would be constructed. Bus stations would be located at each major cross street along the corridor.

Alternative 4F—Peak Period Busway on West 38th Avenue or West 44th Avenue—This alternative would convert an existing lane to a busway on one or both of these arterials that operates only during rush hour in the busy direction. New buses would be added for this alternative, but no new construction would be included.
### TABLE 4-1
Summary of Conceptual Screening Evaluation Matrix: Denver to Golden MIS—I-70 Alignment Alternatives

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Highway Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consistency with National and Regional Goals</td>
<td>Not Applicable (NA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Affordability</th>
<th>NA</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3. Environmental Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Acres disturbed</td>
</tr>
<tr>
<td>b. Wetlands/Sensitive Habitats</td>
</tr>
<tr>
<td>c. Parkland 4(f) &amp; 6(f)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Community Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Property takings</td>
</tr>
</tbody>
</table>
### TABLE 4-1
Summary of Conceptual Screening
Evaluation Matrix: Denver to Golden MIS—I-70 Alignment Alternatives

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Highway Alternatives</th>
<th>Bus/HOV Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative 3B: Add two lanes on I-70 from Wadsworth to I-25</td>
<td>Alternative 3E: High-tech Platform with Moveable Barriers (&quot;Zipper Lane&quot;)</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Same as 3B</td>
</tr>
<tr>
<td></td>
<td>May create lane balancing impacts on Mousetrap and I-70 east elevated section.</td>
<td>Same as 3B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Several grade separated crossings required. Traffic impacts at at-grade crossings.</td>
</tr>
<tr>
<td>c. Citizen support or opposition</td>
<td>None</td>
<td>Likely opposition from adjacent Denver neighborhoods.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No support or opposition.</td>
</tr>
<tr>
<td></td>
<td>Likely opposition from adjacent Denver neighborhoods.</td>
<td>Likely opposition from adjacent Denver neighborhoods.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely opposition from adjacent Denver neighborhoods.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely opposition from adjacent Denver neighborhoods.</td>
</tr>
<tr>
<td>5. Consistency with Local Goals and Plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Jefferson County</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>b. Golden</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>c. Arvada</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>d. Wheat Ridge</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>e. Denver</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>6. Mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Potential qualitative impact on travel times from key points to CBD</td>
<td>Provides little improvement for mobility into the CBD, as no improvements are made from Wadsworth to I-25.</td>
<td>Provides a circuitous route, so travel time to the CBD will be about 5 minutes slower than 4A.</td>
</tr>
<tr>
<td></td>
<td>Would improve travel time into the CBD.</td>
<td>Provides a circuitous route, so travel time to the CBD will be about 5 minutes slower than 4A.</td>
</tr>
<tr>
<td></td>
<td>Similar to 3B; 50-60 mph =&gt; 15-18 minutes Golden to CBD; 10-12 minutes Ward to CBD.</td>
<td>Provides a circuitous route, so travel time to the CBD will be about 5 minutes slower than 4A.</td>
</tr>
<tr>
<td>b. Relief of congestion on I-70</td>
<td>Will provide improvements west of Wadsworth.</td>
<td>Relieves congestion west of Wadsworth; will divert traffic from I-70.</td>
</tr>
<tr>
<td></td>
<td>Will provide improvements east of Wadsworth.</td>
<td>Relieves congestion west of Wadsworth; will divert traffic from I-70.</td>
</tr>
<tr>
<td></td>
<td>Same as 3B.</td>
<td>Same as 3B.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relieves congestion west of Wadsworth; will divert traffic from I-70.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as 4A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Will have a minimal impact on I-70 congestion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Will have a minimal impact on I-70 congestion.</td>
</tr>
</tbody>
</table>
### TABLE 4-1
Summary of Conceptual Screening Evaluation Matrix: Denver to Golden MIS—I-70 Alignment Alternatives

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Highway Alternatives</th>
<th>Bus/HOV Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No-Build</td>
<td>Alternative 3B: Add two lanes on I-70 from Wadsworth to I-25</td>
</tr>
<tr>
<td>c. Provides mobility options</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>d. Service to primary travel markets:</td>
<td>Study area commuters to CBD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>West of study area commuters to CBD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>West of study area to DIA and cross-metro</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Intra-study area east-west</td>
<td>Yes</td>
</tr>
<tr>
<td>7. Agency (Railroad) Acceptability</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>8. Conclusion/Recommendation</td>
<td>NB, TSM/TDM automatically carried forward to Detailed Evaluation.</td>
<td>Carried forward to Detailed Evaluation.</td>
</tr>
</tbody>
</table>
### TABLE 4-1
Summary of Conceptual Screening Evaluation Matrix: Denver to Golden MIS—I-70 Alignment Alternatives

<table>
<thead>
<tr>
<th>Criteria</th>
<th>LRT Alternatives</th>
<th>Commuter Rail Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative 5A: LRT on the Gold Line to DUT</td>
<td>Alternative 5C: LRT from SH58 on I-70 to DUT</td>
</tr>
<tr>
<td>1. Consistency with National and Regional Goals</td>
<td>Consistent with regional and national goals.</td>
<td>Consistent with regional and national goals.</td>
</tr>
<tr>
<td>2. Affordability</td>
<td>Not Golden; Yes to Ward Rd.</td>
<td>No</td>
</tr>
<tr>
<td>a. Capital Cost</td>
<td>$250M-$300M to Ward</td>
<td>$400M-$500M to Ward</td>
</tr>
<tr>
<td>3. Environmental Impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Acres disturbed</td>
<td>140</td>
<td>130</td>
</tr>
<tr>
<td>b. Wetlands/Sensitive Habitats</td>
<td>Same as 3B.</td>
<td>Same as 3B.</td>
</tr>
<tr>
<td>c. Parkland 4(f) &amp; 6(f)</td>
<td>Similar impacts to 3B.</td>
<td>Probable direct impacts on Prospect, Anderson, and Apel-Bacher parks.</td>
</tr>
<tr>
<td>4. Community Impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Property acquisition</td>
<td>Property acquisition may be required for additional ROW especially for stations.</td>
<td>Property acquisitions may be required for area stations along SH58 and I-70.</td>
</tr>
<tr>
<td>b. Traffic/circulation impacts</td>
<td>Same as 4E.</td>
<td>Station locations and auto and pedestrian access.</td>
</tr>
<tr>
<td>5. Consistency with Local Goals and Plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Jefferson County</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>b. Golden</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>c. Arvada</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Table 4-1</td>
<td>Summary of Conceptual Screening Evaluation Matrix: Denver to Golden MIS—I-70 Alignment Alternatives</td>
<td></td>
</tr>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria</th>
<th>LRT Alternatives</th>
<th>Commuter Rail Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative 5A: LRT on the Gold Line to DUT</td>
<td>Alternative 5C: LRT from SH58 on I-70 to DUT</td>
</tr>
<tr>
<td></td>
<td>Alternative 5D: LRT on Arterials from Golden to DUT</td>
<td></td>
</tr>
<tr>
<td>d. Wheat Ridge</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>e. Denver</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| 6. Mobility                                                             |                                                                                  |                                                                                         |
|-------------------------------------------------------------------------|                                                                                  |                                                                                         |
| a. Potential qualitative impact on travel times from key points to CBD  | CBD to Golden: 25-30 mph =>32-38 minutes; CBD to Ward 20-24 minutes.             | Speed of 15-20 mph CBD to Ward =>30-40 minutes; speed to Golden from Ward 40 mph => total 38-48 minutes. | Similar to LRT.                                                                               |
| b. Relief of congestion on I-70                                        | Will have a minimal impact on I-70 congestion.                                   | Will have a minimal impact on I-70 congestion.                                         | Will have a minimal impact on I-70 congestion.                                             |
| c. Provides mobility options                                            | Provides one additional travel option.                                           | Provides one additional travel option.                                                  | Provides one additional travel option.                                                     |
| d. Service to primary travel markets:                                  |                                                                                  |                                                                                         |
| Study area commuters to CBD                                             | Yes                                                                              | No (too slow)                                                                            | Yes                                                                                         |
| West of study area commuters to CBD                                     | Yes                                                                              | No (too slow)                                                                            | No                                                                                         |
| West of study area to DIA and cross-metro                              | Yes, with transfer                                                              | No (too slow)                                                                            | Yes, with transfer                                                                         |
| Intra-study area east-west                                              | Yes                                                                              | Yes                                                                                     | Yes                                                                                         |

| 7. Agency (Railroad) Acceptability                                     |                                                                                  |                                                                                         |
|------------------------------------------------------------------------|                                                                                  |                                                                                         |
| 8. Conclusion/Recommendation                                           | Carried forward to Detailed Evaluation but felt to be less strongly supported than 5C. | Set aside. High environmental impact.                                                  | Carried forward to Detailed Evaluation.                                                    |

DEN/RAH3563/003671149.DOC
5.0 LRT Alternatives

As shown in Figure 4-4, three LRT alternatives were considered during screening:

▼ Alternative 5A — LRT in the Gold Line — This alternative involved the construction of a 16-mile double-track LRT on the Gold Line rail line alignment. Access to DUT could include any of several alignments in the vicinity north of DUT (Rennick and North Yards) or down the I-25 Busway.

▼ Alternative 5C — LRT in the I-70 Alignment — This alternative involved constructing a 16-mile double-track LRT from Golden in the median of SH 58 to I-70 and Wadsworth Boulevard. East of this point, the alignment would follow the I-70 right-of-way (ROW), then down Inca Street, then east on an aerial structure to DUT.

▼ Alternative 5D — LRT on Local Arterials — This alternative located a double-track LRT system from Golden along SH 58 to I-70, and then follows West 44th Avenue to Kipling Street, then south to West 38th Avenue and along West 38th Avenue to DUT. The alignment is approximately 15 miles in length.

6.0 Advanced/Emerging Technologies Alternative

One advanced/emerging technology was considered during screening:

▼ Alternative 6A — Personal Rapid Transit (PRT) — This alternative involved providing automated technology on either the Gold Line or I-70 alignments. The technology was anticipated to be similar to the Vancouver Ski Train in British Columbia.
7.0 Commuter Rail/Diesel Multiple Unit (CR/DMU) Technology Alternatives

As shown in Figure 4-5, two non-FRA-compliant (not compliant with FRA standards for crash criteria) commuter rail alternatives were considered during screening:

- **Alternative 7A — CR/Separate Track on the Gold Line Alignment** — This alternative involved constructing a 16-mile commuter rail system from Golden to DUT in the Gold Line alignment using a separate single track parallel to the existing Burlington Northern/Santa Fe (BN/SF) track. Diesel Multiple Unit (DMU) vehicles, such as the Siemens Regio Sprinter (currently in use in Europe) are assumed to be the technology used.

- **Alternative 7C — CR/DMU on the I-70 Alignment** — This alternative involved constructing a 16-mile commuter rail system from Golden to DUT in the SH 58 and I-70 alignments.

8.0 Conventional Commuter Rail Alternative

As shown in Figure 4-5, one FRA-compliant or conventional commuter rail alternative was considered during screening:

- **Alternative 8A — Commuter Rail with Shared Track in the Gold Line Alignment** — As the name suggests, this alternative involved running a commuter rail system on the same BN/SF track currently used for freight rail, a distance of approximately 16 miles. To meet federal railroad standards, heavier and larger vehicles are used than the DMU vehicles suggested above for the other rail alternatives. These could include traditional locomotives or FRA-compliant DMU-type vehicles.
Screening Process

The Screening-Level Evaluation process is a comparative assessment of the probable effects of each alternative on the community, and the degree to which each alternative addresses project goals, objectives, problems, and needs. Its general purpose is to identify the alternatives that hold the most promise for achieving project goals, while balancing costs and other impacts. The Screening-Level Evaluation is the second of four evaluation stages in the MIS process described earlier. It includes two parts:

▼ Pre-screening
▼ Conceptual Screening

The purpose of screening is to identify the short list of most promising alternatives to carry forward into Detailed Evaluation (DE).

Pre-screening

The pre-screening was used to narrow the list of conceptual alternatives. Pre-screening criteria were used to identify those alternatives from the initial list that should be advanced to the conceptual definition, analysis, and evaluation phase of the process. The project team conducted a two-day workshop to consider technological and cost factors for each alternative. Only alternatives with fatal flaws, such as excessively high costs or unproven technology, or definitions inconsistent with the screening process were eliminated. Fatal flaws that would prevent the alternatives from being built were excessive costs or technological problems. The following alternatives were dropped from further evaluation:

▼ Alternative 3A — Add two lanes on I-70 from SH 58 to I-76 — This alternative is included in the 2020 RTP and is, therefore, an element of the NB Alternative.

▼ Alternative 3C — Add two lanes on I-76 from I-70 to I-25 — This alternative is included in the 2020 RTP and is, therefore, an element of the NB Alternative.

▼ Alternative 7C — CR/Separate Track in the I-70 Alignment — This alternative was eliminated due to high construction costs, construction impacts, and the fact that the commuter geometric requirements (need for grade separations and flyovers) are not suited to the existing geometry of the I-70 corridor.

▼ Alternative 6A — Automated Guideway Transit (AGT) — This alternative involved providing automated technology in either the Gold Line or I-70 alignments. The technology assumed would be similar to the Vancouver Sky Train in Vancouver, British Columbia. This concept was eliminated due to high cost ($50 million to $70 million per mile).

Conceptual Screening Criteria

Criteria were developed based on the Denver MIS Guidance Manual and additional corridor-specific considerations as outlined below. The following criteria categories were used for the Screening-Level Evaluation with specific criteria listed as appropriate. The first three categories and the Mobility category are from the MIS Guidance Manual; the remaining categories were developed from project-specific considerations.

1. Consistency with regional goals
2. Affordability
3. Environmental impacts
   a. Acres disturbed
   b. Wetlands/sensitive habitats
   c. Parklands/open space
4. Community impacts
   a. Property takings
   b. Traffic, circulation, and parking impacts
   c. Citizen support or opposition
5. Consistency with local goals and plans
6. Mobility
   a. Travel time between key locations
   b. Provision of a mobility option to a congested corridor
c. Degree to which the alternative serves the principal travel markets

7. Agency acceptability

Each category of criteria is defined below.

**Consistency with Regional Goals and Policies**

This criterion tested whether each alternative met regional goals and policies. The source of measures was the DRCOG *Metro Vision 2020 Plan* and the 2020 RTP. Applicable transportation goals in Metro Vision include development of a multimodal transportation system, reduced dependence on single-occupant vehicles, and reductions in vehicle miles traveled (VMT) or at least in its rate of growth. Applicable land-use goals include support for urban centers (major activity centers), where development activity and higher densities are focused, supported by enhanced transit service. Applicable environmental goals include support for achieving and maintaining air quality standards.

**Affordability**

The intent of this test was to assess the degree of affordability for an alternative. It is measured by comparing the conceptual cost estimate with the initial budget estimate established for improvements in the corridor. The corridor budget for the I-70 project was set at approximately $300 million to $400 million in 1997 dollars. The budget was based on a dollars per mile figure of $20 million to $25 million established by the MIS Coordinating Committee for all corridors based on the actual construction costs of the Southwest Corridor.

**Environmental Impacts**

This measure was used to eliminate alternatives that clearly had irresolvable environmental impacts. Alternatives with lower levels of environmental impact were considered to be within the range that could be addressed by design modifications and/or mitigation at the time of construction.

**Community Impacts**

Community impacts include potential adverse effects such as property acquisitions, noise and visual intrusions, and restrictions on traffic circulation and parking.

**Community Support**

This measure is similar to the agency measure in that it gauges the degree of support or opposition (or both) for an alternative. Successful implementation of an alternative is much less likely if there is organized broad-based opposition to its concept or application.

**Consistency with Local Goals and Plans**

Local communities evaluate transportation investments based not only on mobility considerations, but also on their ability to influence land use and development patterns. The sources for evaluating this criterion are adopted community plans, including comprehensive plans, and more specific area plans such as neighborhood, district, urban renewal area, and downtown plans.

**Mobility**

The principal mobility measure for the Screening-Level Evaluation was the degree to which an alternative potentially serves one or more of the principal travel markets for the study area. The impact on congestion is also considered. How well an alternative serves a particular travel market requires an assessment of the effects of a number of its characteristics, including alignment location, termini, access points, access methods, speed, frequency, time span of service, and connectivity to other transport facilities.

The following four principal travel markets were identified:

- Study area to the Denver Central Business District (CBD)
- West of the study area to the Denver CBD
- From/through study area to DIA and east metro area (cross-metro market)
East-west intra-study area travel
Potential impacts on congestion were evaluated qualitatively.

Agency Acceptability
Agency support can help to advance a particular alternative while agency opposition can serve to reduce its chance of successful implementation. This screening evaluation category measured the degree to which any one of the relevant agencies is supportive, opposed, or neutral for an alternative. Relevant agencies include transportation and resource agencies, and others affected by or that affect the implementability of an alternative. The majority of these agencies are represented on the TAC.

Results of Conceptual Screening
The results of the conceptual screening evaluation are presented in Table 4-1. A narrative summary of the disposition of the alternatives is given below.

A total of 17 build alternatives were evaluated with five recommended for advancement to Detailed Evaluation. Additionally, the No-Build and TSM alternatives are automatically carried forward as part of the MIS process. Two build alternatives were incorporated into the TSM Alternative. The screening results were subsequently presented to the TAC, PAC, and the public for review. As a result of these meetings, one additional build alternative was added to the list for Detailed Evaluation (Alternative 5C-LRT on the Gold Line and I-70) as further detailed below. The following sections summarize the disposition of each alternative.

1.0 No-Build Alternative
The No-Build Alternative was automatically carried forward to Detailed Evaluation as part of the MIS process. This is because the NB provides the baseline from which to measure the consequences of each of the recommended alternatives.

2.0 Transportation System Management Alternative
The TSM elements were automatically carried forward to Detailed Evaluation as part of the MIS process. This is because the TSM alternative provides the lowest cost option for addressing mobility issues.

The TSM elements included increased bus service, interchange improvements, ITS, incident management improvements, and so forth that would allow the existing transportation infrastructure to better function.

3.0 Highway Alternatives

Alternative 3B—Add Two Lanes on I-70 from Wadsworth Boulevard to I-25. This alternative was carried forward to Detailed Evaluation because it was affordable, served all I-70 travel markets, and reduced congestion on I-70. It also provided a good reference or benchmark from which to assess the other build alternatives.

Alternative 3E—High-Tech Platform. The “zipper lane” alternative was carried forward because of its relatively low cost, ability to serve all travel markets, reduction of traffic congestion on I-70, and minimal environmental impacts. Because this alternative cannot by itself address the corridor’s primary mobility needs, it was included as part of the TSM Alternative. This concept was later rejected due to CDOT concerns regarding operational complexity.

4.0 Bus/HOV Alternatives

Alternative 4A—Buffered Bus/HOV Lane on I-70 from SH 58 to I-25. This alternative was carried forward to Detailed Evaluation because it serves multiple travel markets and is affordable. It was also felt to be the best transit alternative for the I-70 corridor because it would provide greater mobility impacts, would be less costly, and has comparable environmental impacts to an LRT alternative in the I-70 alignment.
Alternative 4B—Buffered Bus/HOV Lanes on I-70 from SH 58 to I-76 and from I-76 to I-25. This alternative was not carried forward to Detailed Evaluation. As compared to 4A, this alternative resulted in greater travel times, was more costly, and did not serve the travel markets as effectively.

Alternative 4C—Exclusive Two-Way Busway on I-70. This alternative was not carried forward to Detailed Evaluation because it served fewer people (only bus riders) and was approximately $100 million more costly than Alternative 4A. It is also probable that this alternative would result in more construction impact than Alternative 4A.

Alternative 4E—Two-Way Busway on the Gold Line Right-of-Way. This alternative was not carried forward to Detailed Evaluation because it would serve fewer people (only bus riders) and reaches fewer travel markets than Alternative 4A. Additionally, this alternative would result in more construction impact and property acquisitions than Alternative 4A.

Alternatives 4F—Peak Period Busway on West 38th Avenue or West 44th Avenue. This alternative was set aside due to limited impact on corridor mobility when compared to the other bus system alternatives.

5.0 LRT Alternatives

Alternative 5A—LRT on the Gold Line. This alternative was originally eliminated from Detailed Evaluation in favor of 5C. However, after the completion of the draft Detailed Evaluation Report, the TAC suggested that this alternative be re-evaluated as a lower cost option to Alternative 5C. As shown later in this report, Alternative 5A eventually became the Locally Preferred Alternative (LPA).

Alternative 5C—LRT in the I-70 Alignment. Although costly, this alternative was carried forward to Detailed Evaluation because of strong community support. The project team originally felt this LRT alignment should be eliminated from Detailed Evaluation due to high costs and high potential impacts. However, the PAC requested that the team carry it forward into Detailed Evaluation.

Alternative 5D—LRT on Local Arterials. This alternative was not carried forward to Detailed Evaluation because of high costs, low travel speeds, and the environmental impacts associated with construction through the neighborhoods along West 38th Avenue. Additionally, as configured, this option would provide transit travel speeds that would be comparable to bus service.

6.0 Commuter Rail/Diesel Multiple Unit Technology Alternative

Alternative 7A—CR/Separate Track on the Gold Line Alignment. This alternative was carried forward to Detailed Evaluation since it is more affordable and was thought to result in less property acquisition and environmental impact than a typical LRT alternative due to the fact that it would only involve the construction of one track versus two for LRT. Because of its lower per-mile cost, it would allow transit service to Golden rather than terminating at Ward Road as required with the LRT Alternatives 5A and 5C. Alternative 7A also provided an opportunity to phase in at a later date a more aggressive (two track) transit plan into the corridor, if warranted.

7.0 Conventional Commuter Rail Alternative

Alternative 8A—CR/Shared Track. This alternative was carried forward to Detailed Evaluation because it was considered affordable and results in limited property acquisition and environmental impact. Due to its low cost, it would allow transit service to Golden and also provide an opportunity to phase a more aggressive transit plan into the corridor at a later date.
SECTION 5
Detailed Evaluation of Final Alternatives

This section presents the Detailed Evaluation of final alternatives. This involved a more rigorous analysis of the best alternatives resulting from Conceptual Screening. A summary of the Detailed Evaluation is given in the following sections:

- Description of alternatives
- Criteria used to evaluate the alternatives
- Results of the Detailed Evaluation

Description of the Final Alternatives

Seven alternatives were subjected to the Detailed Evaluation, including:

- Alternative 1—No-Build (NB)
- Alternative 2—Transportation Systems Management (TSM)
- Alternative 3B—Highway Widening (HY)
- Alternative 4A—Bus/High Occupancy Vehicle (Bus/HOV)
- Alternative 5C—Light Rail Transit (LRT)
- Alternative 7A—Commuter Rail/Separate Track (CR/Separate Track)
- Alternative 8A—Commuter Rail/Shared Track (CR/Shared Track)

Each of these alternatives is described in the following narrative. (Note that these alternatives are similar but further advanced than presented during Conceptual Screening. Thus, some changes have occurred between the “Conceptual” and “Detailed” alternatives.)

Alternative 1—No-Build (NB)

By definition, the No-Build Alternative describes the probable development scenario if no major investment is made. The No-Build Alternative provides an important point of reference for comparing the performance and impacts of the remaining alternatives. There were in fact, two separate No-Build alternatives used for purposes of analysis as described below:

- Existing plus Committed Improvements (E+C). This alternative included existing transportation system elements, plus any projects in the study area included in the DRCOG Transportation Improvement Program (TIP), 1999-2004. This includes interchange improvements at SH 58/I-70, Ward Road/I-70, and Kipling Street/I-70. Outside of the study area, all improvements in the fiscally constrained DRCOG 2020 Regional Transportation Plan (RTP) were assumed to be built.

- RTP. This alternative included E+C, plus any projects in the study area included in the RTP, i.e., widening I-70 between SH 58 and Wadsworth Boulevard and widening I-76 between Wadsworth Boulevard and I-25.

Key Features

The major features of the E+C and 2020 RTP No-Build alternatives are summarized in Table 5-1 and presented in Figure 5-1. Three interchange improvements at an estimated cost of $53 million (1995 $) are included in the E+C No-Build Alternative as listed below:

- SH 58/I-70 Interchange ($33 million)
- Ward Road/I-70 Interchange ($10 million)
- Kipling Street/I-70 Interchange ($10 million)
### TABLE 5-1
No-Build Alternative Improvements

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<td><strong>Lane Improvements</strong></td>
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<td>I-70 SH 58 to Wadsworth Boulevard</td>
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<td>I-70 Wadsworth Boulevard to I-25</td>
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<td>I-76 Wadsworth Boulevard to I-25</td>
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<td>Federal North of I-76</td>
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<td><strong>Interchange Improvements</strong></td>
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<td>Kipling Street and I-70</td>
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The SH 58 and Ward Road interchanges will be built as one project. It will reconfigure both interchanges to add full directional movements as well as better circulation for commercial vehicles. The Kipling Street project is primarily a reconstruction project.

The RTP No-Build Alternative will add an estimated $96 million (1995$) in highway-related improvements along I-70 and I-76 as summarized below:

- **Widen I-70** from six to eight lanes from SH 58 to Wadsworth Boulevard ($34 million).
- **Widen I-76** from four to six lanes from I-70 to I-25 ($62 million).

The RTP also contains modest improvements to the arterial connections to the highway network, including adding two lanes to Wadsworth Boulevard from U.S. 6 to I-70 and adding two lanes to Federal Boulevard north of I-76.

**Figure 5-1**

Alternative 1-No-Build 2020 RTP Improvements

I-70 Denver to Golden MIS
Alternative 2—Transportation System Management

Alternative 2–TSM is a package of mutually supportive projects intended to improve operational efficiency and reduce travel demand in the corridor without resorting to a single major infrastructure investment. By definition, Alternative 2–TSM is affordable and cost-effective. It also provides an important reference for comparison to the major investment alternatives, since it represents the best that can be done without a major infrastructure investment. The elements of Alternative 2–TSM are shown in Figure 5-2.

Alternative 2–TSM includes approximately $62 million (1997 $) in major improvements. The greatest expense is associated with enhanced bus service in the study area. The TSM elements include the following:

- Major bus system improvements ($20 million)
- Three new park-n-Rides: Golden (Washington/SH 58); West 44th Avenue/McIntyre Street; Federal Boulevard and West 58th Avenue ($7.6 million)
- Direct connection bus ramps at the Ward Road park-n-Ride ($3 million)
- Interchange improvements at Pecos Street ($17 million)
- Enhanced Incident Management from SH 58 to I-25 including the purchase of a commercial tow-truck vehicle ($1.5 million)
- Enhanced ITS from SH 58 to I-25 ($5 million)
- Ramp metering at Ward Road, Kipling Street, Sheridan Boulevard, and Federal Boulevard (cost included in ITS above)
- Signage improvements at the I-76/I-25 and I-70/I-25 interchanges ($30,000)
- Bike and pedestrian facility improvements ($5 million allowance)

Bus System Improvements

The bus service improvements for the TSM alternative are described below in Figure 5-3.
The greatest enhancements are in the western portions of the study area. The TSM bus-operating plan included service frequency improvements and route realignments or extensions for many of the existing routes. The TSM Alternative also included proposals for new local and express routes. No changes were proposed to the bus service routing for the eastern portion of the study area.

**Local Route Modifications**

1. **Route 6 — East 6th Avenue/North Pecos.**
   No changes are proposed to the current routing. Proposed service levels are 30-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

2. **Route 17 — Jefferson County.** The route would be turned back in Golden. The segment between Golden and the Ward Road park-n-Ride would be replaced by Route 32, 32nd Avenue. Proposed service levels are 30-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

3. **Route 31 — North Federal.** No changes are proposed to the No-Build routing. Proposed service levels on both branches are 20-minute peak periods/20-minute off-peak periods (same as Alternative 1–NB).

4. **Route 32 — 32nd Avenue.** The route is modified to operate west of Applewood Village Shopping Plaza along 32nd Avenue, McIntyre Street, and 44th Avenue to Golden. This route extension replaces Route 17, Jefco between the Ward Road park-n-Ride and Golden. Proposed service levels are 30-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

5. **Route 38 — West 38th Avenue.** No changes are proposed to the current routing. Proposed service levels are 20-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

6. **Route 44 — 44th Avenue.** The route would be extended to the West 44th Avenue/ McIntyre Street park-n-Ride. Proposed service levels are 30-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

7. **Route 51 — Sheridan Crosstown.** No changes are proposed to the current routing. Proposed service levels are 30-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

8. **Route 52 — West 52nd Avenue/South Pearl Street.** The route would be modified to operate on West 52nd Avenue west of Wadsworth Boulevard, through Ridge Homes redevelopment along Ridge Road, West 52nd Avenue west and McIntyre Street south to the new park-n-Ride at McIntyre Street and 44th Avenue. Proposed service levels are 15-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

9. **Route 64 — Arvada.** The previous Route 64, Arvada Circulator, has been changed to Route 164. The new route would operate along West 64th Avenue between the Broadway park-n-Ride at 70th Avenue and the McIntyre Street/West 44th Avenue park-n-Ride. Proposed service levels are 30-minute peak periods/30-minute off-peak periods.

10. **Route 72 — 72nd Avenue Crosstown.** The route would be modified to operate along West 72nd Avenue to Indiana Street north, 82nd Avenue east, and Alkire Street south to 72nd Avenue. Proposed service levels are 30-minute peak periods/30-minute off-peak periods (same as Alternative 1–NB).

11. **Route 76 — Wadsworth Boulevard Crosstown.** No changes are proposed to the current routing. Proposed service levels are 15-minute peak periods/15-minute off-peak periods (same as Alternative 1–NB).

12. **Route 80 — 80th Avenue Crosstown.** The route would be modified to operate west on 80th Avenue to Simms Street, serve the park-n-Ride at Simms Street and 86th Avenue, and then proceed south along Simms Street to West 72nd Avenue and
Ward Road to the Ward Road park-n-Ride. Proposed service levels would be improved to 30-minute peak periods/60-minute off-peak periods.

13. **Route 100 — Kipling Street Crosstown.** No changes are proposed to the Alternative 1–NB routing. Proposed service levels would be 30-minute peak periods/30-minute off-peak periods.

14. **Route 125 — Denver West Crosstown.** The route would be modified to serve West 58th Avenue/Ralston Road to the Olde Town park-n-Ride. Proposed service levels are 15-minute peak periods/30-minute off-peak periods.

15. **Route 132 — 44th/McIntyre Street-U.S. 36/96th.** The route identified in the DRCOG 2020 RTP would be modified to operate south along Eldridge Street, West 58th Avenue, Indiana Street, and West 44th Avenue to the West 44th Avenue/McIntyre Street park-n-Ride. Proposed service levels are 30-minute peak periods/30-minute off-peak periods.

16. **Route 164 — Arvada Circulator.** The new route provides the following routing: Olde Town park-n-Ride, Vance Street, West 55th Avenue, Wadsworth Boulevard, Ralston Road, Carr Street, West 74th Avenue, Carr Street, West 80th Street, Pomona Drive, Lamar Street, West 80th Avenue, Pierce Street, West 68th Avenue, Lamar Street, West 55th Avenue, and Vance Street to the Olde Town park-n-Ride. Proposed bi-directional service levels are 30-minute peak periods/30-minute off-peak periods.

**Limited Route Modifications**

1. **Route 38 Ltd. — West 38th Avenue.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak period, peak direction only.

2. **Route 44 Ltd. — West 44th Avenue.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak period, peak direction only.

**Express Route Modifications**

1. **Route 6X — Ward Road/CS/I-25 and Broadway Express.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak period, peak direction only (same as Alternative 1–NB).

2. **Route 58X — West 58th Express.** The route would be modified to start at the Simms Street/West 86th Avenue park-n-Ride, with express stops along Simms Street, West 72nd Avenue, Oak Street, Ralston Road, Independence Street, Ridge Road, Miller Street (serving the Ridge Home redevelopment site), West 49th Avenue and Kipling Street, taking I-70 to downtown Denver. Proposed service levels are 30-minute peak period, peak direction only.

3. **Route 68X — North Pierce Express.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak period, peak direction only.

4. **Route 70X — Ward Road — I-25/Broadway.** A new express route from the Ward Road park-n-Ride to the I-25/Broadway LRT Station. Proposed service levels are 30-minute peak period, peak direction only.

5. **Route 72X — Ward Road Express.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak period, peak direction only.

6. **Route 75X — Olde Town/MW Express.** No changes are proposed to the No-Build routing. Proposed service levels are limited, with only two trips (same as Alternative 1–NB).

7. **Route 76X — North Wadsworth Express.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak period only (same as Alternative 1–NB).

8. **Route 131X — Federal/58th Avenue Express.** This is a new express route to
downtown Denver from a new park-n-Ride located at Federal Boulevard and 58th Avenue. Proposed service levels would be 30-minute peak period, peak direction only.

9. **Route 144X — Golden/McIntyre Express.**
This is a new express route to downtown Denver that serves park-n-Rides located in Golden and at McIntyre Street and 44th Avenue. Proposed service levels are 30-minute peak periods, peak direction only.

**Regional Route Modifications**

1. **Route CC — Coal Creek/Wondervu.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak periods/60-minute off-peak periods.

2. **Route G — Boulder/Golden/Federal Center.** No changes are proposed to the No-Build routing. Proposed service levels are 30-minute peak periods/60-minute off-peak periods.

**skyRide Route Modifications**

1. **Route AR — DIA/Arvada.** A new route between the Ward Road park-n-Ride, Olde Town park-n-Ride, and DIA. Route AA begins service at the Thornton park-n-Ride. Proposed service levels are 60-minutes all day.

**Alternative 3B—Highway Widening (HY)**

As shown in Figure 5-4, this alternative consists of widening I-70 from six to eight lanes between Wadsworth Boulevard on the west and I-25 on the east, a distance of 4.8 miles. These additional travel lanes would be 12 feet, with full-width 12-foot inside and outside shoulders. The completion of this widening would result in an eight-lane segment through the entire length of the study area, from SH 58 on the west to I-25 on the east. The cost of this alternative is estimated at $122 million.

**Roadway Improvements**
The widening would include the addition of two travel lanes; regrading of side slopes and related features within the cross-section; necessary drainage improvements; utility locations; and revised signing, striping, and traffic control. The built cross-section would be 146 feet including eight travel lanes at 12 feet, inside and outside shoulders at 12 feet, and a 2-foot jersey barrier. The entire ROW at full-width would be 170 feet with an additional 12 feet on each side for side slopes. Approximately 75 percent of the corridor length is assumed to be built with retaining walls.

**Structure Modifications**

This alternative would result in the reconstruction of all bridge structures for north-south arterials crossing the highway including:

- Harlan Street
- Sheridan Boulevard
- Tennyson Street
- Lowell Street
- Federal Boulevard
- Zuni Street
- Pecos Street

**Bus System Improvements**
The bus system for the highway alternative is identical to Alternative 2–TSM.

**Alternative 4A—Bus/HOV**

As shown in Figure 5-5, this alternative consists of adding one highway lane in each direction between SH 58 and I-25, a distance of about 10 miles. These additional lanes would be reserved for the exclusive use of buses and multioccupant vehicles. The cost of this alternative is estimated at $265 million.
Figure 5-4
Alternative 3B-Highway Widening Proposed Elements
I-70 Denver to Golden MI/S

Figure 5-5
Alternative 4A-Bus/HOV Proposed Elements
I-70 Denver to Golden MI/S
**Roadway Improvements**

Between Wadsworth Boulevard and I-25, this alternative would be the same as Alternative 3B–HY, except that an additional 4 feet of width is needed to separate the Bus/HOV lane from the general-purpose lanes. This 4-foot buffer would be a painted line rather than a barrier, which would allow for the option of using the lane for general-purpose travel in off-peak hours. Between SH 58 and Wadsworth Boulevard, this option would replace the additional two travel lanes included in the RTP with Bus/HOV lanes. An additional 4 feet would be added to the cross-section in each direction for the buffer. The resulting section for the segment would be three 12-foot general-purpose travel lanes, a 4-foot buffer, a 12-foot Bus/HOV lane, and 12-foot inside and outside shoulders in each direction. The typical section would be 154 feet within a 170-foot minimum ROW. As in Alternative 3B–Highway Widening, retaining walls will be required throughout most of the segment east of Wadsworth Boulevard.

Bus ramps connecting the Ward Road park-n-Ride with I-70 would be provided to improve bus travel times.

Bridge replacement will be required for all of the north-south arterials crossing I-70, and would be the same as stated for Alternative 3B above.

The connection between the Bus/HOV lanes on I-70 and the existing barrier-separated Bus/HOV lanes in the median of I-25 would involve the construction of an elevated structure starting in the vicinity of Huron Street and descending into the median of I-25 in the vicinity of West 44th Avenue. This new connection would carry reversible flow bus and carpool traffic between I-25 south and I-70 west. In addition to the construction of approximately ½ mile of elevated roadway, approximately 2,000 to 3,000 lineal feet of I-25 would have to be widened and reconstructed to accommodate the connector roadway.

**Bus System Improvements**

The bus system for Alternative 4A–Bus/HOV is identical to that for the bus system for Alternative 2–TSM and Alternative 3–HY, with the following express route modifications.

**Express Route Modifications**

1. **Route 58X—W. 58th Express.** No changes are proposed to Alternative 2–TSM routing. Service frequencies are improved from 30 to 15 minutes in the peak period, peak direction.

2. **Route 68X—North Pierce Express.** No changes are proposed to Alternative 2–TSM routing. Service frequencies are improved from 30 to 20 minutes in the peak period, peak direction.

3. **Route 70X—Ward Road—I-25/Broadway.** No changes are proposed to Alternative 2–TSM routing. Service frequencies are improved from 30 to 20 minutes in the peak period, peak direction.

4. **Route 72X—Ward Road Express.** No changes are proposed to Alternative 2–TSM routing. Service frequencies are improved from 30 to 15 minutes in the peak period, peak direction.

5. **Route 76X—North Wadsworth Boulevard Express.** No changes are proposed to Alternative 2–TSM peak period routing. Peak period, reverse peak direction service and midday bi-directional service would be added between the Olde Town park-n-Ride and downtown Denver at a 60-minute frequency. Proposed peak period, peak direction service levels are 20 minutes.

6. **Route 131X—Federal/58th Ave. Express.** No changes are proposed to Alternative 2–TSM routing. Service frequencies are improved from 30 to 15 minutes in the peak period, peak direction.

7. **Route 144X—Golden/McIntyre Express.** Peak period, peak direction routing would
be the same as Alternative 2–TSM. Peak period, reverse peak direction trips would be added with a stop at the Ward Road park-n-Ride. Midday trips would also include a stop at the Ward Road park-n-Ride (both directions). Proposed peak period, peak direction service levels are 15 minutes. Reverse peak direction and midday service would operate at 60-minute frequency.

These express bus service improvements emphasize the use of the Bus/HOV lane improvements made along the corridor. Composite express route service frequencies (peak period, peak direction) from corridor transit facilities to downtown Denver are as follows:

▼ **Olde Town** — The composite peak period, peak direction headway to downtown Denver is improved to 8.5 minutes from 12 minutes operated in Alternative 2–TSM.

▼ **Ward Road** — Peak period, peak direction headway to downtown Denver is improved to 8.5 minutes from 15 minutes operated in Alternative 2–TSM.

▼ **44th/McIntyre** — Peak period, peak direction headway to downtown Denver is improved to 15 minutes from 30 minutes operated in Alternative 2–TSM.

▼ **Federal/58th** — Peak period, peak direction headway to downtown Denver is improved to 15 minutes from 30 minutes operated in Alternative 2–TSM.

▼ **Ridge Homes** — Peak period, peak direction headway to downtown Denver is improved to 15 minutes from 30 minutes operated in Alternative 2–TSM.

Alternative 5C—Light Rail Transit on the Gold Line and I-70 Alignments

This alternative involved the construction of a double-track LRT from a planned park-n-Ride facility in downtown Golden at SH 58 and Washington Street to DUT in downtown Denver, a distance of about 16 miles. Because of the corridor’s length and estimated cost, the project would be expected to be built in two phases, with Phase I terminating at the Ward Road park-n-Ride and Phase II extending to downtown Golden (refer to Figure 5-6). The cost of Phase I was estimated at $382 million and the cost of Phase II an additional $100 million.

**Operating Plan**

The operating plan assumed 7.5-minute peak weekday and 15-minute off-peak service (30-minute evening). LRT service would operate between the hours of 4:00 a.m. and 1:30 a.m. Total travel time was estimated at approximately 34 minutes to Golden and 25 minutes to Ward Road. The Phase I LRT line to Ward Road requires nine train sets, operating two car trains during peak periods, resulting in 18 peak period light rail vehicles (LRV). Including spare LRVs, a total fleet of 22 vehicles would be required.

The Phase II LRT line to Golden requires 12 train sets, operating two car trains during the peak periods, resulting in a peak period LRV requirement of 24, plus an additional five vehicles as spares for a fleet of 29 LRVs.

**Alignment Locations and Improvements**

Alternative 5C–LRT was a variation on Alternatives 5A and 5C developed as a result of CTF and PAC input during the definition of the detailed alternatives. This alternative calls for a double-track LRT system from Denver Union Terminal (DUT) initially to Ward Road (Phase I) and ultimately to the City of Golden (Phase II), a distance of approximately 11 miles for Phase I and 16 miles for both phases. From DUT, the alignment ascends on aerial structure over the consolidated main line (CML) and the South Platte River. From this point, the alignment follows Inca Street north to I-70, where the guideway is placed in the I-70 median to Marshall Street. The guideway parallels Marshall Street north to 56th Avenue and west to, and under, Wadsworth Boulevard, then northwest to the Gold Line right-of-way (ROW). From the Gold Line ROW, the alignment travels southeast...
just to the west of Tabor Street to the existing Ward Road park-n-Ride, which is the terminus of Phase I.

Two alignments were included for Phase II: the first follows SH 58 to Golden and the second follows the Gold Line to Golden.

**Stations**
Eight stations would be planned for Phase I: DUT, West 38th Avenue, Pecos Street, Federal Boulevard, Sheridan Boulevard, Olde Town Arvada, Ridge Home Arvada, and Ward Road. Two new stations are planned for Phase II, one in the vicinity of McIntyre Street and another in Golden.

**LRT Maintenance Facility.** One 10- to 20-acre light maintenance facility would be planned on the alignment. It would be ideally located in the industrial zones between Federal and Sheridan or between Ward Road and McIntyre Street. The following elements would be included:

- Tail tracks
- Train washing facilities
- Maintenance facilities
- Outdoor and indoor storage

**Bus System Improvements**
The bus system is essentially identical to the bus system in Alternative 2-TSM, with routing adjusted to feed the LRT stations to the maximum extent possible. Below is a listing of the routes serving each LRT station.

- **Golden Station** (only applicable for full LRT alignment to Golden): Local Routes 17 and 32, and Regional Route G
- **44th and McIntyre Station**: Local Routes 32, 44, 52, 64, and 132, and Limited Route 44L
- **Ward Road Station**: Local Routes 44, 52, 80, and 125, Limited Route 44L, and Express Routes 6X and 72X
- **Ridge Home Station**: Local Routes 52 and 100, and Express Route 58X
- **Olde Town Arvada Station**: Local Routes 52, 64, 76, 125, and 164, Express Routes 68X, 75x, and 76X, and Regional Route CC
- **Sheridan Station**: Local Route 51
- **Federal Station**: Local Routes 31 and 52
- **Pecos Station**: Local Routes 6 and 52
• 38th Avenue Station: Local Routes 6, 17, 38, and 52

Listed below are those routes that have service improvements in addition to adjustments to serve LRT stations.

**Local Route Modifications**

1. **Route 44—West 44th Avenue.** Route is shortened to Ward Road for Phase I LRT line.

2. **Route 51—Sheridan Crosstown.** A short line is added between Westminster Mall and the Sheridan LRT Station. This additional service would operate at 15-minute peak period service, peak direction only, resulting in a “blended” headway with the regular Route 51 service of 10 minutes.

3. **Route 52—West 52nd Avenue/South Pearl.** Route is shortened to Ward Road for Phase I LRT line.

4. **Route 64—Arvada.** Route is extended east along West 44th Avenue to Ward Road for Phase I LRT line.

5. **Route 76—Wadsworth Crosstown.** A short line is added between the Broomfield park-n-Ride and the Olde Town Arvada LRT Station. This additional service would operate at 30-minute peak period service, peak direction only, resulting in a “blended” headway with the regular #76 service of 10 minutes.

6. **Route 132—44th/McIntyre—U.S. 36/96th.** Route is modified to terminate at the Ward Road LRT Station under the Phase I LRT line.

7. **Route 164—Arvada Circulator.** The new route provides the following routing: Olde Town park-n-Ride, Vance Street, West 55th Avenue, Wadsworth Boulevard, Ralston Road, Carr Street, West 74th Avenue, Carr Street, West 80th Street, Pomona Drive, Lamar Street, West 80th Avenue, Pierce Street, West 68th Avenue, Lamar Street, West 55th Avenue, and Vance Street to the Olde Town park-n-Ride. Proposed bi-directional service levels are 15-minute peak periods/30-minute off-peak periods.

**Limited Route Modifications**

1. **Route 44 Ltd.—W. 44th Avenue.** Route is shortened to the Ward Road LRT Station.

**Express Route Modifications**

1. **Route 6X—Ward Road/Cold Spring/I-25 & Broadway.** Route is extended north to the Ward Road LRT Station.

2. **Route 58X—West 58th Express.** Route is modified to become peak period feeder service to the Ridge Home LRT Station.

3. **Route 68X—North Pierce Express.** Route is modified to become peak period feeder service to the Olde Town Arvada LRT Station.

4. **Route 70X—Ward Road—I-25/Broadway.** Route is eliminated and replaced with LRT service.

5. **Route 72X—Ward Road Express.** Route is modified to become peak period feeder service to the Ward Road LRT Station.

6. **Route 76X—North Wadsworth Express.** Route is modified to become peak period feeder service to the Olde Town Arvada LRT Station.

7. **Route 131X—Federal/58th Avenue Express.** Route is eliminated and replaced with LRT service.

8. **Route 144X—Golden/McIntyre Express.** Route is eliminated and replaced with LRT service for the Phase II LRT line, operating between Golden and the Ward Road LRT Station for Phase I LRT line.

**skyRide Route Modifications**

1. **Route AR—DIA/Arvada.** Route is eliminated and replaced with LRT service.

**TSM Improvements**

TSM improvements for this alternative are identical to the Alternative 2—TSM with the following exception:

• The special bus-only on-ramps from the Ward Road park-n-Ride to eastbound I-70 would not be implemented.
Three new park-n-Rides would not be implemented.

**Alternative 7A—Commuter Rail/Separate Track**

As shown in Figure 5-7, this alternative involved the construction of a single-track diesel multiple unit (DMU) system from DUT to a planned park-n-Ride facility in downtown Golden at SH 58 and Washington, a distance of about 16 miles. This alternative is estimated to cost $281 million.

**Preliminary Operating Plan**

The operating plan assumes 15-minute peak weekday and 30-minute off-peak service. Total travel time was estimated at 36 minutes each way. Total cycle time of 90 minutes included 9 minutes of layover and recovery time at each end of the line. A total of six train sets is required to maintain desired service. Two-car train sets would be required to meet ridership projections, requiring 12 peak and 14 fleet DMUs.

**Passing Track**

This alternative would require five segments of passing track to maintain desired service levels. The passing track segments would require a minimum of 500 feet, but are planned for 2,500-foot lengths to maintain operating speeds. In sections with passing track, an additional 15 feet of ROW, or 60 feet in total, would be required to accommodate both the DMU and freight rail systems.

**Stations**

A total of nine stations were anticipated for this alternative: DUT, West 38th Avenue, Federal Boulevard, Sheridan Boulevard, Olde Town, Ridge Home, Ward Road, McIntyre Street, and Golden.

**Alignment Locations**

Initiating at DUT, the alignment travels north under the 20th Street Viaduct and ascends on aerial structure closely paralleling 23rd Street over the CML and the South Platte River and touches ground just to the south of I-25. From this point, it tunnels under the interstate and parallels Inca Street to I-70. The guideway passes over I-70 and travels north through industrial land to an abandoned railroad ROW entering the Gold Line alignment just to the west of Utah Junction. From this point, the alignment travels in the Gold Line ROW to just west of Tabor Street, then southwest for 0.7 mile across open land to the existing Ward Road park-n-Ride. From there, the alignment would most probably follow SH 58 to the Golden Station. As with Alternative 5C-LRT, a second option for this segment would be to follow the Gold Line alignment from the Ward Road Station to the Golden Station.

**Right-of-Way Requirements**

This alignment would require a minimum of 15 feet of ROW to accommodate a single DMU rail vehicle track. Where the DMU track is sharing ROW with the BN/SF freight rail line, a total minimum ROW of 45 feet would be required, based on FRA-mandated minimum spacing of 30 feet (centerline to centerline). (As mentioned earlier, 60 feet of ROW would be required in areas requiring passing track.)

The existing Gold Line ROW is 100 feet from Tabor Street to Lamar Street, 50 feet from Lamar to Harlan, and 66 feet from Harlan to C&S Junction. At C&S Junction, the ROW expands to 100 feet, but the track is consolidated with BN/SF sharing with the UP/Moffat rail line. Minimum spacings would require relocation and reconstruction of the freight track bed in sections of less than 100 feet of ROW.
DMU Maintenance Facility

One 10-acre light maintenance facility would be planned on the alignment. It would be ideally located in the industrial zones between Federal and Sheridan or between Ward Road and McIntyre. The following elements would be included:

- Tail tracks
- Train washing facilities
- Maintenance facilities
- Outdoor and indoor storage

Bus System Improvements

The proposed bus system changes would be similar to the bus system for Alternative 2-TSM with the addition of a bus feeder system to the transit stations. Below is a listing of the routes serving each DMU station.

- Golden Station: Local Routes 17 and 32, and Regional Route G
- 44th and McIntyre Station: Local Routes 32, 44, 52, 64, and 132, and Limited Route 44L
- Ward Road Station: Local Routes 44, 80, and 125, Limited Route 44L, and Express Routes 6X and 72X
- Ridge Home Station: Local Routes 52 and 100, and Express Route 58X
- Olde Town Arvada Station: Local Routes 52, 64, 76, 125, and 164, Express Routes 68X, 75x, and 76X, and Regional Route CC
- Sheridan Station: Local Route 51
- Federal Station: Local Route 31
- 38th Avenue Station: Local Routes 6, 38, and 52

Listed below are those routes that have service improvements in addition to adjustments to serve DMU stations.

Limited Route Modifications

1. **Route 44 Ltd. – W 44th Avenue.** This route would be shortened at the McIntyre DMU Station.
Express Route Modifications

1. **Route 58X—West 58th Express.** Route is modified to become peak period feeder service to the Ridge Home DMU Station.
2. **Route 68X—North Pierce Express.** Route is modified to become peak period feeder service to the Olde Town Arvada DMU Station.
3. **Route 70X—Ward Road—I-25/Broadway.** Route is eliminated and replaced with DMU service.
4. **Route 72X—Ward Road Express.** Route is modified to become peak period feeder service to the Ward Road DMU Station.
5. **Route 76X—North Wadsworth Express.** Route is modified to become peak period feeder service to the Olde Town Arvada DMU Station.
6. **Route 131X—Federal/58th Avenue Express.** Route is eliminated and replaced with DMU service.
7. **Route 144X—Golden/McIntyre Express.** Route is eliminated and replaced with DMU service.

skyRide Route Modifications

1. **Route AR—DIA/Arvada.** Route is eliminated and replaced with DMU service.

TSM Improvements

The TSM improvements and strategies would be the same as for Alternative 2—TSM with the following exception:

- The special bus-only on-ramps from the Ward Road park-n-Ride to eastbound I-70 would not be implemented.

- Three new park-n-Rides would not be implemented.

Alternate 8A—Commuter Rail/Shared Track

As shown in Figure 5-8, this alternative would provide commuter rail service between downtown Golden and DUT, a distance of about 16 miles. The intent would be to provide low-cost starter rail transit service by using the existing BN/SF freight track on the Gold Line.

Preliminary Operating Plan

The operating plan assumed 30-minute peak period weekday service only. There would be four inbound trips and one outbound trip in the morning with reverse service in the afternoon rush hour. Total travel time would be 35 minutes.

Three train sets (two cars per train) would be needed because these trains are built as articulated two-car sets. One train has the ability to provide a reverse peak period trip in both the a.m. and p.m. rush hours. Siemens-Duewag VT610 diesel multiple-unit vehicles are assumed, with each car able to seat 85 passengers. To maintain desired levels of service, the operations plan assumes maximum speeds of 65 mph where possible, installation of a centralized traffic control (CTC) system on the BN line, and expansion of track and signal systems to allow the simultaneous operation of passenger and freight trains.

Alignment Locations and Improvements

The proposed alignment starts at DUT and travels north under the 20th Street Viaduct, than ascends an aerial structure paralleling 23rd Avenue clearing the CML and the South Platte River. From this point, the alignment travels through Rennick Yards north to Utah Junction where the line continues on new track parallel to the UP/Moffat Line to C&S Junction. From this point, the alignment goes to the Golden Station located at 10th and Ford Streets.

Existing freight track would need to be upgraded to meet FRA Class 4 standards and be equipped with signals. All existing street and highway grade crossings would require
enhanced grade crossing protection. This would include re-timing of the grade crossing predictors as a result of increased speeds and the installation of crossing gates where they are not now provided.

### Stations

Eight stations were anticipated for this alternative: DUT, West 38th Avenue, Federal Boulevard, Olde Town, Ridge Home, Ward Road, McIntyre Street, and Golden.

### Right-of-Way Requirements

The existing ROW in this corridor is 100 feet from Golden to Eldridge, 50 feet through the Mount Olivet Cemetery, 100 feet from the east edge of the cemetery to Lamar, 50 feet from Lamar to Harlan, and 66 feet from Harlan to C&S Junction. At C&S Junction, the ROW expands to 100 feet, but the track is consolidated with BN/SF sharing with the UP/Moffat Line. The use of FRA-compliant vehicles should allow for construction of all segments of passing track within the existing ROW.

### Bus System Improvements

The bus system would be the same as the bus system and Alternative 7A–Commuter Rail/Separate Track with the following exceptions:

- **Route AR—DIA/Arvada.** The route would continue to operate with stops at the Ward Road and Olde Town Arvada DMU Stations.

- **Route 144X.** Inbound and outbound service would be provided to compensate for the absence of train service during the off-peak periods.

### TSM Improvements

The TSM improvements would be the same as the Alternative 2–TSM with the following exceptions:

---

**Figure 5-8**

Alternative 8A-Commuter Rail/Shared Track

Proposed Elements

1-70 Denver to Golden MIS
The special bus-only on-ramps from the Ward Road park-n-Ride to eastbound I-70 would not be implemented.

Three new park-n-Rides would not be implemented.

Detailed Evaluation

Evaluation Criteria
The RTD Guidance Manual provides the basis for developing the Detailed Evaluation criteria. These criteria are considered the minimum listing of areas that must be evaluated to select the Locally Preferred Alternative (LPA) from the alternatives identified in the screening-level evaluation. The project team was encouraged to add corridor-specific criteria. For the Denver to Golden corridor, the following additional criteria were developed: acres disturbed, land-use compatibility, economic development potential, safety, impacts on service, surface water impacts, and visual impacts.

General Groupings of Criteria
The Detailed Evaluation criteria are categorized into four general areas:

- Cost
- Effectiveness
- Cost-effectiveness
- Community and environmental impacts

Each of these general categories and the supporting criteria are defined below at the beginning of each evaluation.

Results of Detailed Evaluation
A summary of the results is given below for each of the criteria. The narrative focuses on the relative ranking of the alternatives with respect to the criteria and discriminators among the alternatives. In many cases, the criteria do not provide a sufficient level of difference to influence the selection of the LPA.

Cost Measures
Three cost measures are estimated at Detailed Evaluation:

- Capital cost
- Operation and maintenance (O&M) costs
- Total annual cost

All of the cost measures influenced the selection of the LPA.

Capital Cost. Capital cost is the amount of investment required to construct an alternative. Capital costs include elements such as excavation, new pavements, drainage, lighting, and signage for highway alternatives and trackwork, signalization, electrification, communications systems, and vehicles for the rail alternatives. Capital cost estimates are based on the unit costs (prices for specific quantities of materials and labor) provided in the RTD Guidance Manual.

Table 5-2 presents the capital cost estimates for the build alternatives in 1997 dollars.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Capital Cost (1997 $ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–TSM</td>
<td>$62.0</td>
</tr>
<tr>
<td>3B–HY</td>
<td>$122.0</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>$265.0</td>
</tr>
<tr>
<td>5C–LRT to Ward Road (Phase I only)</td>
<td>$382.0</td>
</tr>
<tr>
<td>5C–LRT to Golden (Phase I and II)</td>
<td>$480.0</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>$281.0</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>$83.0</td>
</tr>
</tbody>
</table>

Operation and Maintenance Cost. O&M cost is the amount of investment needed to operate and maintain an alternative, including costs such as labor for operating vehicles, repair of pavements and guideways, and maintenance of landscapes. O&M cost is measured on a cost per year basis.

Table 5-3 presents the estimated O&M cost for the build alternatives.
### Table 5-3

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Cost Per Year (1997 $ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–TSM</td>
<td>$10.8</td>
</tr>
<tr>
<td>3B–HY&lt;sup&gt;a&lt;/sup&gt;</td>
<td>$9.8</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>$11.0</td>
</tr>
<tr>
<td>5C–LRT to Ward Road (Phase I only)</td>
<td>$11.6</td>
</tr>
<tr>
<td>5C–LRT to Golden (Phase I and II)</td>
<td>$13.4</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>$9.8</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>$5.8</td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes the cost ($9.6 million) of bus service improvements.

The degree of cost for transit alternatives is driven proportionately by the level of service and convenience. Alternative 5C–LRT could be expected to cost more than Alternatives 7A–CR/Separate Track or 8A–CR/Shared Track due to much higher levels of service (eight trains per hour versus four trains and two trains, respectively). Alternative 4A–Bus/HOV costs about the same to operate as the rail alternatives, and significantly more per year to operate than Alternative 3B–HY due to the high costs for enforcement of the HOV lanes and operation of the buses.

### Total Annual Cost

Total annual cost includes the annualized capital cost (in essence, the mortgage at 7 percent interest over 30 years) plus the annual O&M. This is the value that is used to calculate “user cost.” Table 5-4 shows the total annual cost for the build alternatives.

### Table 5-4

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total Annual Cost (1997 $ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–TSM</td>
<td>$17.2</td>
</tr>
<tr>
<td>3B–HY</td>
<td>$20.6</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>$33.3</td>
</tr>
<tr>
<td>5C–LRT to Ward Road (Phase I only)</td>
<td>$43.3</td>
</tr>
<tr>
<td>5C–LRT to Golden (Phase I and II)</td>
<td>$53.1</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>$33.1</td>
</tr>
<tr>
<td>8A–CR Shared Track</td>
<td>$12.9</td>
</tr>
</tbody>
</table>

### Effectiveness

LPA effectiveness criteria are shown in Table 5-5. Criteria that served as discriminators among the alternatives are noted with a “yes.” Discriminators are defined as issues that received the highest level of interest by the CTF, PAC, TAC, and public.

### Table 5-5

<table>
<thead>
<tr>
<th>Category</th>
<th>Represented a Discriminator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Yes</td>
</tr>
<tr>
<td>Expandability</td>
<td>Yes</td>
</tr>
<tr>
<td>Maximum Link Utilization</td>
<td>No</td>
</tr>
<tr>
<td>Number of Total Users</td>
<td>No</td>
</tr>
<tr>
<td>New Users</td>
<td>Yes</td>
</tr>
<tr>
<td>New Transit Linked Trips</td>
<td>No</td>
</tr>
<tr>
<td>Congestion</td>
<td>Yes</td>
</tr>
<tr>
<td>Travel Time</td>
<td>Yes</td>
</tr>
<tr>
<td>Reliability</td>
<td>Yes</td>
</tr>
<tr>
<td>Impact on the Movement of Freight</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The following sections provide narrative descriptions only for those criteria that were identified as discriminators in the preceding table.

### Capacity

Capacity is the ability of an alternative to carry people or freight. The units used for evaluation are defined as carrying capacity per one direction per hour. The
performance of the alternatives is provided in Table 5-6.

**TABLE 5-6**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3B–HY</td>
<td>2,800</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>4,527</td>
</tr>
<tr>
<td>5C–LRT</td>
<td>3,000</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>1,200</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>816</td>
</tr>
</tbody>
</table>

**Expandability.** Expandability is a measure of how easy it will be to increase the relative ease that the capacity of an alternative can be augmented in the future. The rail alternatives are rated as superior for this criterion. For example, the capacity of Alternative 5C–LRT could be doubled by increasing the headway or by adding cars. The capacity of either Alternatives 7A–CR/Separate Track or 8A–CR/Shared Track could be doubled or even tripled with the addition of a second track, increasing headways, and adding vehicles to the operational consists. The addition of a second track could be accommodated within the existing BN/SF Railroad ROW if the freight track were moved to one side of the ROW. Thus, the expansion could be completed with minimal environmental impact and property acquisition.

Neither Alternative 3B–HY nor 4A–Bus/HOV can be easily expanded due to ROW and land-use limitations along the I-70 alignment east of Wadsworth Boulevard to I-25. The addition of lanes in this area would require extensive property acquisitions with associated community impacts. Property acquisitions would include residences, small businesses, and parkland. The acquisition of parkland would trigger the need for a 4(f) analysis. To further complicate the implementation of expanding either of these alternatives, it is probable that the construction would include impacts to low-income and/or minority populations (referred to as Environmental Justice [EJ] impacts).

Alternative 2–TSM can easily be augmented but would have a lower impact on capacity than any of the build alternatives. The addition of most TSM elements, such as bus service, ITS, and incident management, are also subject to diminishing returns.

**New Users.** The number of new users is defined as new patrons on the major investment. For example, single occupant automobile users that are diverted to HOVs (or carpools) are not considered new users, since they are already using the existing I-70 infrastructure. Table 5-7 presents the number of new users.

**TABLE 5-7**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>New Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–NB</td>
<td>NA</td>
</tr>
<tr>
<td>2–TSM</td>
<td>9,380</td>
</tr>
<tr>
<td>3B–HY</td>
<td>21,834</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>30,870</td>
</tr>
<tr>
<td>5C–LRT to Ward Road (Phase I only)</td>
<td>11,690</td>
</tr>
<tr>
<td>5C–LRT to Golden (Phase I and II)</td>
<td>13,467</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>4,774</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>2,140</td>
</tr>
</tbody>
</table>

As shown in the table above, the number of new users on the major investment would be the same as the number of total users for Alternatives 2–TSM, 5C–LRT, 7A–CR/Separate Track, and 8A–CR/Shared Track. This is because these alternatives are totally new programs with no current users. By contrast, Alternatives 3B–HY and 4A–Bus/HOV involve modifications to existing infrastructure with existing users. For example, under Alternative 3B–HY, 21,834 new users are anticipated. Of this number, 9,380 are new bus patrons, resulting from the bus program proposed as part of this alternative, and 12,454 are new highway users. New highway users are calculated by comparing the number of persons using I-70 under Alternative 1–NB as compared to the modeled number of persons using I-70 assuming the implementation of Alternative 3B. An estimated 30,870 new users are realized with Alternative 4A–Bus/HOV. This total consists of 2,045 new bus transit users and 28,825 new HOV (or carpool) users.
**Congestion.** This criteria calculates the number of freeway lane miles that are congested for three hours or more (severe congestion) during a typical workday. As mentioned previously, severe congestion is defined as a volume to capacity (v/c) ratio of greater than 0.95. Table 5-8 summarizes the results of the congestion evaluation.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Lane Miles of Severe Congestion on I-70 (2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–NB</td>
<td>11</td>
</tr>
<tr>
<td>2–TSM</td>
<td>5</td>
</tr>
<tr>
<td>3B–HY</td>
<td>0</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>0</td>
</tr>
<tr>
<td>5C–LRT to Ward Road (Phase I)</td>
<td>5</td>
</tr>
<tr>
<td>5C–LRT to Golden (Phase I and II)</td>
<td>5</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>5</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>5</td>
</tr>
</tbody>
</table>

As shown above, Alternative 1–NB would result in 11 lane miles of severe congestion on I-70. The rail alternatives, 5C–LRT, 7A–CR/Separate Track, and 8A–CR/Shared Track, all result in 5 miles of severe congestion, as does Alternative 2–TSM. The congestion that does occur is typically east of Lowell in the eastbound (EB) direction and in the Federal/Lowell area in the westbound (WB) direction. EB congestion typically occurs during the a.m. peak period and WB congestion during the p.m. peak period.

By comparison, Alternatives 3B–HY and 4A–Bus/HOV do not result in the same levels of “severe” congestion. This is because both of these alternatives add highway capacity with travel lanes on I-70.

**Travel Time.** The travel time criteria measure the in-vehicle trip time between Golden and DUT during the a.m. peak hour. This allows the travel time between highway and transit alternatives to be compared. Table 5-9 presents the travel time results by alternative.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>2020 Travel Time: Highway</th>
<th>2020 Travel Time: Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–NB</td>
<td>41 minutes</td>
<td>NA</td>
</tr>
<tr>
<td>2–TSM</td>
<td>40 minutes</td>
<td>NA</td>
</tr>
<tr>
<td>3B–HY</td>
<td>39 minutes</td>
<td>NA</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>39 minutes</td>
<td>33 minutes (HOV)</td>
</tr>
<tr>
<td>5C–LRT to Ward Road (Phase I only)</td>
<td>25 minutes</td>
<td>23 minutes (LRT)</td>
</tr>
<tr>
<td>5C–LRT to Golden (Phase I and II)</td>
<td>39 minutes</td>
<td>33 minutes (LRT)</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>40 minutes</td>
<td>35 minutes (Commuter Rail)</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>40 minutes</td>
<td>35 minutes (Commuter Rail)</td>
</tr>
</tbody>
</table>

a Ward Road to DUT

The travel time on I-70 from SH 58 to DUT varies by only 2 minutes for all of the build alternatives. The fastest year 2020 travel time at 39 minutes on I-70 is realized with Alternatives 3B–HY and 4A–Bus/HOV. As mentioned earlier, these are the only two alternatives that provide capacity improvements to I-70. The remaining alternatives, 2–TSM, 5C–LRT, 7A–CR/Separate Track, and 8A–CR/Shared Track, result in only a 1-minute reduction over the Alternative 1–NB, which results in a travel time of 41 minutes.

As shown in Table 5-9, peak morning travel times are from 4 to 6 minutes faster in 2020 using a transit mode than automobile travel on I-70. Alternative 4A–Bus/HOV provides a 33-minute trip, and the rail alternatives, 5C–LRT, 7A–CR/Separate Track, and 8A–CR/Shared Track, provide a 2020 travel time from Golden to DUT from 33 to 35 minutes.

**Reliability.** Reliability is defined as the consistency with which a major investment provides service during incidents such as accidents or inclement weather. Alternatives that cannot function well during an incident are not considered reliable. Because Alternatives 5C–LRT, 7A–CR/Separate Track, and 8A–CR/Shared Track are generally not...
affected by weather, congestion, or accidents, they are considered more reliable than Alternatives 3B–HY and 4A–Bus/HOV, which are greatly affected by these conditions. In fact, the ability to meet travel schedules during peak congested periods during the morning and evening is one of the greatest advantages of any of the rail alternatives. The reliability of Alternative 2–TSM is similar to Alternative 3B–HY.

**Freight Movements.** This measure assesses the impact of the alternatives on major regional commodity flows and local freight deliveries. Because Alternative 3B–HY increases highway capacity and reduces congestion, it would be the best option for commercial vehicles. This option has a v/c ratio of 0.92 compared to 1.06 under the No-Build Alternative. Although Alternative 4A–Bus/HOV adds highway capacity for HOV autos, it could not (under current restrictions) be used by commercial vehicles. The additional capacity does lower the v/c ratio to 0.98, making it the second-ranked alternative. The rail alternatives are all ranked significantly lower for commercial vehicles and, therefore, for freight movements with v/c ratios of 1.05 or 1.06. Alternative 2–TSM is similarly ranked.

**Cost-Effectiveness**

The cost-effectiveness evaluation combines the capital and O&M cost results with the effectiveness information developed immediately above to define the financial performance of each alternative. The following measures were used:

- Cost per total user
- Cost per new user

Of the two, the “cost per new user” metric proved to be the most important.

**Cost per New User**

The cost per new user indicates the number of new persons using the major investment. The number of “total” users as measured above does not account for the fact that a new LRT system may be diverting trips from an existing public bus system, or that single occupant vehicle operators move to car pools. The “new user” measure accounts for the fact that some persons may be diverted from one mode to another. Therefore, the intent of this measure is to determine if continued maintenance of existing practices may be more cost-effective than movement to a new mode, such as LRT transit. The results of the new user analysis are shown in Table 5-10.

As indicated in Table 5-10, the cost per new user ranges from a low of $2.78 for Alternative 3B–HY to a high of $23.18 for Alternative 7A–CR/Separate Track. The analysis indicates that the cost per user varies nearly proportionately to the cost of the alternative. The most cost-effective alternatives, 3B–HY and 4A–Bus/HOV, have the highest number of users. Alternative 2–TSM realizes a new user cost of $5.41, which reflects the cost of the proposed enhanced bus system. The new user cost for Alternative 5C–LRT varies from $12.40 to $13.19, depending on whether the system ends at Ward Road or extends to the City of Golden. The higher new user cost to Golden is a result of poorer ridership west of Ward Road. For this reason, it has been suggested that LRT not be extended beyond Ward Road. The new user costs for Alternatives 7A–CR/Separate Track and 8A–CR/Shared Track are high at $23.18 and $20.26, respectively, reflecting relatively poor ridership as compared to the investment.

**Environmental and Community Impacts**

The assessment of environmental and community impacts was provided to disclose the consequences of implementing any one of the major investments. The intent was not to conduct an environmental assessment, but rather to indicate significant differences in potential impacts among the alternatives. A detailed environmental impact statement would be required during the preliminary
TABLE 5-10
Cost per New User Year 2020

<table>
<thead>
<tr>
<th>Alternative</th>
<th>New Users (On the Major Investment) in 2020</th>
<th>Annual Cost ($ Million)</th>
<th>$ Per New Transit User</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–NB</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2–TSM</td>
<td>9,380</td>
<td>$17.2</td>
<td>$5.41</td>
</tr>
<tr>
<td>3B–HY</td>
<td>21,834</td>
<td>$20.6a</td>
<td>$2.78</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>30,870</td>
<td>$33.0b</td>
<td>$3.63</td>
</tr>
<tr>
<td>5C–LRT on I-70 to Ward Road (Phase I only)</td>
<td>11,690</td>
<td>$43.3b</td>
<td>$12.40</td>
</tr>
<tr>
<td>5C–LRT on I-70 to Golden (Phase I and II)</td>
<td>13,467</td>
<td>$53.1b</td>
<td>$13.19</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>4,774</td>
<td>$33.1b</td>
<td>$23.18</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>2,140</td>
<td>$12.9b</td>
<td>$20.26</td>
</tr>
</tbody>
</table>

*a* Includes O&M costs for operating the bus element.

*b* Includes O&M cost for the bus feeder system only, since other bus riders are not included with rail transit users.

design of the selected alternative. The following environmental categories are evaluated in this section. The categories that most influenced the selection of an LPA are indicated in Table 5-11 and described in the following sections.

TABLE 5-11
Most Significant Impact Measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Represented a Discriminator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres disturbed</td>
<td>Yes</td>
</tr>
<tr>
<td>Wetlands</td>
<td>No</td>
</tr>
<tr>
<td>4 (f) parkland</td>
<td>Yes</td>
</tr>
<tr>
<td>Air quality</td>
<td>No</td>
</tr>
<tr>
<td>Threatened and endangered (T&amp;E) species</td>
<td>No</td>
</tr>
<tr>
<td>Environmental Justice (EJ)</td>
<td>Yes</td>
</tr>
<tr>
<td>Displacements</td>
<td>Yes</td>
</tr>
<tr>
<td>Neighborhood disruption</td>
<td>Yes</td>
</tr>
<tr>
<td>Hazardous materials</td>
<td>No</td>
</tr>
<tr>
<td>Land-use compatibility</td>
<td>Yes</td>
</tr>
<tr>
<td>Economic development potential</td>
<td>Yes</td>
</tr>
<tr>
<td>Safety</td>
<td>No</td>
</tr>
<tr>
<td>Noise</td>
<td>Yes</td>
</tr>
<tr>
<td>Surface water impacts</td>
<td>No</td>
</tr>
<tr>
<td>Visual impacts</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Acres Disturbed

Acres disturbed are based on estimating the number of acres impacted during construction. This measure is used as an overall indicator for quantifying potential impacts. The footprint of the area disturbed during construction is assumed to be 50 to 100 percent larger than the size of the facility after construction. In general, the greater the length and number of components associated with an alternative, the larger the number of acres disturbed.

Of equal importance is the location of the acres that are affected. For example, construction through vacant, disturbed industrial land can be expected to have less of an environmental impact (on either natural or human environments) than construction through undisturbed natural areas or urbanized areas. All of the five build alternatives traverse urbanized and/or disturbed acreage. Table 5-12 presents the estimated acres disturbed by each alternative.
TABLE 5-12

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–TSM</td>
<td>&lt;20</td>
</tr>
<tr>
<td>3B–HY</td>
<td>41</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>70</td>
</tr>
<tr>
<td>5C–LRT to Ward Road (Phase I only)(^a)</td>
<td>110</td>
</tr>
<tr>
<td>5C–LRT to Golden (Phase I and II)(^a)</td>
<td>150</td>
</tr>
<tr>
<td>7A–CR/Separate Track(^a)</td>
<td>100</td>
</tr>
<tr>
<td>8A–CR/Shared Track(^b)</td>
<td>50</td>
</tr>
</tbody>
</table>

\(^a\) Includes guideway, stations, and a maintenance facility
\(^b\) Includes guideway and stations

The alternatives that require the widening of the I-70 footprint, including Alternatives 3B–HY, 4A–Bus/HOV, and 5C–LRT, are anticipated to involve the greatest construction impact. These impacts would be categorized as affecting the “human” environment along either side of I-70. Few impacts are anticipated on the natural environment, as this area is categorized as urban and disturbed. Alternatives 7A–CR/Separate Track and 8A–CR/Shared Track impacts would generally be limited to either existing BN/SF ROW or industrial lands. Alternative 2–TSM would have minimal impact.

4(f) Parks

Impacts to parkland can be categorized as either direct impacts involving the acquisition of park property or indirect impacts such as noise, dust, and visual impacts resulting from construction and operation. None of the built alternatives is anticipated to require the acquisition of park property for ROW. However, the potential to affect parks along I-70 was found to be highly contentious. The I-70 alignment directly passes by Willis Case Municipal Golf Course, Berkeley Lake Park, and Rocky Mountain Lake Park. Alternatives 3B–HY, 4A–Bus/HOV, and 5C–LRT all involve the widening of the I-70 footprint from Wadsworth Boulevard to I-25. To provide these improvements, it will be necessary to construct to the limits of the ROW mostly on retained fill. Park property is not anticipated to be directly taken, but there is a potential for indirect impacts to Willis Case Golf Course and Berkeley Park near Sheridan Boulevard and Rocky Mountain Lake Park near Federal Boulevard.

The commuter rail alternatives, 7A–CR/Separate Track and 8A–CR/Shared Track, are not anticipated to impact parkland because they are contained within existing rail ROW along the Gold Line. As a result, the Gold Line alignment was preferred with respect to this issue.

Environmental Justice

Environmental justice impacts are defined as disproportionate negative impacts on low-income and/or minority populations. EJ areas are defined as neighborhoods or traffic analysis zones (TAZs) with greater than 50 percent minority populations and/or 50 percent low-income households. Most of Northwest Denver north of 38th and south of I-70 has greater than 50 percent concentrations of Hispanic populations. Only the Sunnyside and Globeville neighborhoods meet the low income criteria. Impacts to special populations are identified both during construction and operation. In many cases, the operational impacts can be positive, such as providing mobility options to populations who have not had access to these services before project implementation.

Alternatives 3B–HY, 4A–Bus/HOV, and 5C-LRT all involve the widening of I-70. There is a potential for impacting low-income and/or minority households along the I-70 corridor with additional highway noise and air quality impacts, with the level of potential impact being about equal for all three alternatives. Likewise, all of the rail alternatives, 5C–LRT, 7A–CR/Separate Track, and 8A–CR/Shared Track, involve construction near Inca Street, which traverses through a low-income and minority neighborhood. The level of potential impact is greatest for Alternative 5C–LRT because it requires more land for its double-track configuration. Alternative 7A–CR/Separate Track would require land for the addition of a new single track. Alternative 8A–CR/Shared Track would require...
Track presents little potential for impacts on these special populations since it requires no acquisition of land for track construction. All of the rail alternatives would require the acquisition of property for transit stations. The potential for impacts is greatest at the 38th Avenue, Pecos, and Federal Boulevard stations. The potential for impacts associated with any of these alternatives would need to be carefully considered during design.

As a positive consideration, all of the alternatives would provide mobility improvements for these special populations. As mentioned earlier, each of the alternatives includes an aggressive bus transit component that will improve mobility options. Of the alternatives, 5C–LRT is anticipated to provide the greatest potential mobility benefit to these special populations. This is because the alignment is close to the neighborhoods (along I-70 east of Wadsworth Boulevard), and provides the highest level of service of the alternatives.

**Displacements**

Displacements estimate the number of homes and/or businesses that would need to be acquired to build the alternative. Alternative 3B–HY and Alternative 4A–HOV are not anticipated to require acquisition of any existing businesses or residences. The improvements are expected to be contained within the existing ROW. The commuter rail alternatives (7A–CR/Separate Track and 8A–CR/Shared Track) are expected to displace some businesses in order to site the Golden, McIntyre, Ward Road, Sheridan, and Federal stations. The number of businesses would depend on the exact station locations, but are estimated at 10 to 20 small businesses. It is also possible that 5 to 10 residences may have to be acquired depending on the location of the passing track. The rail corridor is expected to be contained within the existing railroad ROW and not require any acquisitions.

Alternative 5C–LRT is estimated to result in 10 to 20 business displacements and 10 to 20 residential displacements, largely because of station development. There is a potential for 5 to 10 displacements on the alignment itself on the segment connecting the Gold Line to SH 58 near Ward Road and on the segment connecting the Gold Line with the I-70 alignment along West 56th and Marshall Street.

**Neighborhood Disruption**

Neighborhood disruption is quantified as the number of home sites within 300 feet of the major investment. Additional criteria within this category are changes in accessibility to community facilities (particularly schools), closure of streets, and neighborhood fragmentation.

Alternative 4A–Bus/HOV presents the greatest potential for neighborhood disruption because it passes within 300 feet of more than 1,200 homes. This is closely followed by Alternative 5C–LRT, which is anticipated to pass approximately 850 homes. By comparison, Alternative 3B–HY will pass approximately 320 homes, and Alternatives 7A–CR/Separate Track and 8A–CR/Shared Track, commuter rail, will pass approximately 360 homes. All three of the rail alternatives will pass within a ½ mile of three schools near Olde Town Arvada.

Because all of the build alternatives follow existing transportation corridors, neighborhood fragmentation (caused when a man-made or natural barrier subdivides a neighborhood or community) would not be substantially different than under current conditions. However, there is concern that by increasing rail traffic on the Gold Line alignment, crossing the tracks would become more difficult, particularly in the vicinity of Olde Town where several schools are located near the line. This potential impact would be most noticeable with Alternative 5C–LRT, because it calls for eight trains per hour in the morning and evening peak periods and four trains per hour in the off-peak periods. By comparison, Alternative 7A–CR/Separate Track involves one-half as many train trips as Alternative 5C–LRT and Alternative 8A–CR/Shared Track, with only three trains per hour for 2 hours (six trains) in the morning and evening. Adding either general-purpose lanes for Alternative 3B–HY or HOV lanes for
Alternative 4A–Bus/HOV would not add to neighborhood fragmentation.

It was concluded that alternatives located on the Gold Line are less apt to generate additional impacts to residential neighborhoods.

**Land-Use Compatibility**

Land-use compatibility is defined as the compatibility of an alternative with surrounding land uses. The measure also includes consideration of the project’s compatibility with planned or future land-use plans developed by local governments.

It has been concluded that all of the alternatives are generally consistent with existing and future land-use plans and zoning. This is because all of the alternatives represent expansions within existing transportation corridors. For example, adding a track to an existing railroad corridor, or a lane to an existing highway, is considered compatible from land use and zoning standpoints.

The greatest potential change in land use would be associated with building stations under any of the rail alternatives. In general, rail stations can be considered incompatible with single-family detached residential development and compatible with other land uses. Under Alternative 5C–LRT, the Sheridan, Federal, and Pecos stations are potentially inconsistent with the adjacent low-density residential development. By comparison, all of the stations for Alternatives 7A–CR/Separate Track and 8A–CR/Shared Track are generally consistent with both current and future land-use plans. These stations are typically surrounded by commercial or industrial development.

The rail alternatives present a better potential for controlling land use through the encouragement of transit-oriented development (TOD) than do Alternatives 3B–HY and 4A–Bus/HOV. Highway improvements are generally considered to encourage “sprawled” or fragmented development. The wider “footprints” would result in travel lanes and retaining walls being about 15 feet closer to existing properties.

Input from the public suggests that this be considered a negative impact.

It can be concluded that Alternative 5C–LRT represents the greatest potential for land-use conflicts.

**Economic Development Potential**

Economic development potential is measured by an alternative’s ability to stimulate either job opportunity or real estate investment. There are several different criteria in this category, including 1) potential for TOD, 2) potential for joint development, 3) potential for highway-oriented commercial development, and 4) construction-related employment benefits.

The rail alternatives (5C–LRT, 7A–CR/Separate Track, 8A–Shared Track) are considered to have the potential to stimulate TOD where there are opportunities for infill or redevelopment at higher densities adjacent to stations. The greatest potential for TOD development is anticipated around the Golden Station, Ridge Home, and Olde Town stations in Arvada and the West 38th Station in Denver. All three of the rail alternatives ultimately include stations at these locations. Additional opportunities may exist for TOD development at the Sheridan Boulevard, Federal Boulevard, and Pecos Street stations under Alternative 5C–LRT. The extent of this potential depends on station location and the amount of remaining redevelopment land available for private development. The surrounding land use on the Gold Line stations east of Wadsworth Boulevard is not as conducive to TOD. Therefore, the economic development potential of the commuter rail alternatives is considered lower.

There is no significant potential for joint development at the above stations. All property values in the vicinity of the stations need to be considerably higher to justify the cost of structured parking to allow for private development on RTD projects. Only minor potential exists for additional commercial development at highway interchanges associated with Alternatives 5C–LRT and 4A–Bus/HOV. This is because the highway
already exists and commercial development has already occurred at most interchanges. There is some potential for commercial redevelopment or marginal uses at the Pecos, Federal and Kipling, and Ward Road interchanges.

Based on the above factors, Alternative 5C–LRT represents the greatest potential for economic development.

All of the alternatives offer employment opportunities during construction. The potential benefit is directly correlated to the construction costs. Therefore, Alternatives 4A–Bus/HOV, 5C–LRT, and 7A–CR/Separate Track represent the greatest potential for construction employment, simply because they are the most expensive.

**Noise**

Because they involve additional activity over the No-Build baseline, all of the build alternatives represent potential noise increases during construction and operation. The Detailed Evaluation considered the number of home sites within 100 feet of the project to quantify construction impacts and within 300 feet of the project to quantify potential operational impacts.

Alternatives 5C–LRT and 7A–CR/Separate Track pass within 100 feet of 225 and 160 residents, respectively. By comparison, Alternative 3B–HY would pass 75 residences, and Alternative 4A–Bus/HOV would pass approximately 140. In summary, potential noise increases during construction are probably greater for the rail alternatives.

Regarding operation, the rail alternatives also represent the potential for a greater noise impact. All of the rail alternatives represent additional trains operating in the alignment. As mentioned above, Alternative 5C–LRT has the most aggressive operations plan at eight trains per hour during the peak periods and four trains per hour during other times. Alternative 7A–CR/Separate Track represents four trains per hour during the peak periods and two trains per hour during other times. Alternative 8A–CR/Shared Track provides a total of 12 trains per day.

The operation of Alternatives 3B–HY and 4A–Bus/HOV will probably have minimal effect on noise due to the fact that the number of people traveling the corridor is approximately the same as under the No-Build Alternative. However, under either Alternative 3B–HY and 4A–Bus/HOV, motorists will be traveling at higher speeds and closer to adjacent residents, which would increase noise.

**Visual Impacts**

Visual impacts are characterized as visual changes to the surrounding environment. These impacts can be positive, neutral, and/or negative. Negative impacts are those changes that are incompatible with the surrounding land uses. There is generally a correlation between the magnitude of construction and the level of visual change. Table 5-13 summarizes the potential for visual impact.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Potential for Visual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–TSM</td>
<td>1</td>
</tr>
<tr>
<td>3B–HY</td>
<td>3</td>
</tr>
<tr>
<td>4A–Bus/HOV</td>
<td>3.5</td>
</tr>
<tr>
<td>5C–LRT to Ward Road</td>
<td>4.5</td>
</tr>
<tr>
<td>5C–LRT to Golden</td>
<td>5</td>
</tr>
<tr>
<td>7A–CR/Separate Track</td>
<td>3.5</td>
</tr>
<tr>
<td>8A–CR/Shared Track</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: 5 equals highest potential for visual impact

Alternative 5C–LRT is anticipated to represent the greatest amount of visual change of any of the build alternatives. These visual changes result from the installation of more than 16 miles of catenary for traction power, 12 to 15 substations, and elevated structures. Approximately 3.5 miles of retaining wall and three aerial stations would be required between Wadsworth Boulevard and I-25. At grade, LRT stations would also modify their surroundings.

The visual impact of Alternative 7A–CR/Separate Track is less than 5C–LRT, but probably more than for the other build
alternatives. Elevated structures will also be an issue for Alternative 7A–CR/Separate Track. The visual impacts of the stations would be similar to Alternative 5C–LRT. However, Alternative 7A–CR/Separate Track does not include the catenary, substations, and retaining walls needed to implement Alternative 5C–LRT. One new track would be constructed for Alternative 7A–CR/Separate Track, compared to two new tracks for Alternative 5C–LRT.

The visual impact of Alternative 8A–CR/Shared Track is anticipated to be modest throughout most segments of the corridor. This is because few new guideway elements (track and structures) are added. Conversely, new stations would be included, resulting in similar issues cited for Alternatives 5C–LRT and 7A–CR/Seaprate Track.

Alternative 4–Bus/HOV is anticipated to rank third (behind Alternatives 5C–LRT and 7A–CR/Seaprate Track) for visual change. The approximately 4,000-foot flyover connector from I-70 to I-25 is also anticipated to represent a significant visual change. The addition of 3.5 miles of retaining walls and freeway lanes for this alternative will result in a wider cross-section of I-70 (i.e., an eight-lane highway is wider than a six-lane highway). Twelve bridges along the alignment would also be reconstructed to accommodate the new HOV lanes. Although this would represent a visual change, it is generally consistent with the current visual character. The on-ramps constructed at the Ward Road park-n-Ride would affect the Ward Road interchange area.

The impact of Alternative 3B–HY is similar to 4A–Bus/HOV, but to a lesser extent. Additional lanes and retaining walls would be added, and seven bridges would be widened or replaced.

Alternative 2–TSM is anticipated to have the least visual impact of the build alternatives. Visual changes would be caused by the addition of new signs, ITS variable message signs, bus-only ramps at the Ward Road park-n-Ride, and interchange improvements at Pecos Street.
SECTION 6
Development of the Locally Preferred Alternative

Decision Process

This section presents the decision process used to select the LPA and provides a detailed description of the elements of the LPA. The LPA evaluation and selection process was structured into seven steps:

- **Step 1** — Presentation of the Detailed Evaluation results to the CTF, TAC, and PAC
- **Step 2** — Development of “packages,” including the best elements of the alternatives with complementary TSM improvements
- **Step 3** — Summary evaluation and ranking of the packages
- **Step 4** — Short-listing of LPA packages with the CTF, TAC, and PAC
- **Step 5** — Selection of the Draft LPA with the CTF, TAC, and PAC
- **Step 6** — Presentation of the Draft LPA to the public
- **Step 7** — Presentation of the Recommended LPA to the RTD Board

Presentation of the Detailed Evaluation Results

A New Alternative is Developed

The results of the Detailed Evaluation were presented to the CTF, TAC, PAC, and the RTD Board. At the TAC meeting, it was suggested that the project team resurrect the concept of LRT on the Gold Line, which was the original Alternative 5A eliminated at the Conceptual Screening phase. The project team then conducted a detailed evaluation of this alternative, focusing on its effectiveness, cost-effectiveness, and impacts.

The analysis concluded that capital costs would be about $100 million lower than Alternative 5C-LRT, and that year 2020 ridership, at 14,031, would be higher than 5C-LRT. Additionally, no significant negative environmental or community impacts were identified. Consequently, Alternative 5A was carried forward and included as an element of the alternative LPA packages.

Development of LPA Packages

The seven multimodal transportation packages were configured from the best elements of the detailed alternatives. The following packages were presented to the CTF, TAC, and PAC:

- **Package 1** — No-Build
- **Package 2** — TSM
- **Package 3** — Highway Widening (Alternative 3B) combined with TSM
- **Package 4** — Bus/HOV (Alternative 4A) combined with TSM
- **Package 5A** — LRT on the Gold Line from Ward Road to DUT (Alternative 5A reconsidered as a result of the Detailed Evaluation) combined with TSM
- **Package 5C** — LRT on the Gold Line and I-70 from DUT to Ward Road (Alternative 5C) combined with TSM
- **Package 6** — LRT on the Gold Line from DUT to Ward Road (same as Alternative 5A above) combined with Highway Widening (similar to 3B, Wadsworth to I-25) and TSM
Evaluation and Short-Listing of Alternative Packages

The project team evaluated the seven alternative packages and presented the results to the CTF, TAC, and PAC as summarized in Table 6-1. These groups then ranked the packages, which resulted in a short-listing of concepts.

CTF Actions
The CTF recommended the following three packages (in order of priority) be carried forward for further evaluation:

▼ Package 5A – LRT on the Gold Line from DUT to Ward Road combined with TSM
▼ Package 6 – LRT on the Gold Line from DUT to Ward Road combined with Highway Widening (Alternative 3B) and TSM
▼ Package 5C – LRT on the Gold Line and I-70 from DUT to Ward Road combined with TSM

TAC Actions
The TAC did not make a recommendation for the following reasons:

▼ More time was needed to analyze the project team’s recommendation.
▼ More information was requested on the project cost and effectiveness numbers and a revised summary evaluation.
▼ Increased committee attendance was needed for more input.
▼ RTD’s General Manager had indicated he would recommend to the RTD Board to delay action on the four MISs until updated model results were available that incorporate the new population and employment forecasts.

PAC Actions
At the time of its meeting, the RTD General Manager’s recommendation had taken effect.

After receiving the same presentation given to the CTF and TAC, the PAC recommended the alternative packages be reduced to the following two in no order of preference:

▼ Package 5A – LRT on the Gold Line from DUT to Ward Road combined with TSM
▼ Package 5C – LRT on the Gold Line and I-70 from DUT to Ward Road combined with TSM

Commuter Rail Alternatives
The two commuter rail alternatives, 7A-CR/Separate Track and 8A-CR/Shared Track, were not included in any of the final packages. Through assessment of the Detailed Evaluation results by the project team, it was determined that both commuter rail alternatives were not as effective as LRT for the following reasons:

▼ Both alternatives provide a lower level of service due to physical and operating constraints. For example, the shared track alternative can only operate during the morning and afternoon peak period because the track is used at other times of the day by the BN/SF for freight delivery.
▼ Because of the lower level of service, ridership is estimated to be much lower for these alternatives than for LRT.
▼ Because capital and operation and maintenance costs were relatively high compared to ridership, these alternatives were not as cost-effective as LRT.

Selection of the Draft LPA
The PAC short list (Packages 5A–LRT on the Gold Line/TSM and 5C–LRT on I-70/TSM) were presented to the CTF, TAC, and PAC with additional information in September 1999. Table 6-2 presents a summary of information that was presented to the committees and used as the basis for their decision.
### TABLE 6-1
Summary Assessment of Alternative Packages

<table>
<thead>
<tr>
<th>Alternative Package</th>
<th>Cost</th>
<th>Effectiveness</th>
<th>Cost-Effectiveness</th>
<th>Expandability</th>
<th>Environment Impacts</th>
<th>Community Impact</th>
<th>Community Support</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package 2—TSM</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>22.0</td>
</tr>
<tr>
<td>Package 3—Highway Widening (3B) combined with TSM</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>21.5</td>
</tr>
<tr>
<td>Package 4—HOV (4A) combined with TSM</td>
<td>3</td>
<td>4</td>
<td>4.5</td>
<td>2</td>
<td>3</td>
<td>2.5</td>
<td>2.5</td>
<td>21.5</td>
</tr>
<tr>
<td>Package 5A—LRT on the Gold Line from DUT to Ward Road with TSM</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>25.5</td>
</tr>
<tr>
<td>Package 5C—LRT on the Gold Line and I-70 alignment from DUT to Ward Road combined with TSM</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2.5</td>
<td>3</td>
<td>16.5</td>
</tr>
<tr>
<td>Package 6—LRT on the Gold Line from DUT to Ward Road combined with Highway Widening and TSM</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>3.5</td>
<td>21.5</td>
</tr>
</tbody>
</table>

* Note: 5 is the highest score, 3 is the median, and 1 is lowest.

### TABLE 6-2
Information Used as the Basis for Selection of the LPA

<table>
<thead>
<tr>
<th>Package/Criteria</th>
<th>Package 5A—LRT on the Gold Line/TSM</th>
<th>Package 5C—LRT on I-70/TSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Costb</td>
<td>$316 million</td>
<td>$418 million</td>
</tr>
<tr>
<td>Effectivenessb</td>
<td>14,031 users</td>
<td>11,690 users</td>
</tr>
<tr>
<td>Cost-Effectiveness</td>
<td>$7.98/user</td>
<td>$12.40/user</td>
</tr>
<tr>
<td>Environmental Impacts</td>
<td>Few impacts to the natural environment due to use of existing RR ROW</td>
<td>Few impacts to the natural environment due to use of the I-70 ROW</td>
</tr>
<tr>
<td></td>
<td>Possible impacts to wetlands near Lowell Boulevard</td>
<td></td>
</tr>
<tr>
<td>Community Impacts</td>
<td>Less impact (construction and operational) on the human community due to fewer homes near the project</td>
<td>Greater impacts, especially to homes along the I-70 corridor, due to the need to widen I-70 to accommodate the LRT</td>
</tr>
<tr>
<td></td>
<td>More potential for impacts to existing parks</td>
<td></td>
</tr>
<tr>
<td>Community Support</td>
<td>Strong community support (particularly as compared to HOV, Widening of I-70, or either of the Commuter Rail alternatives) based on the public process provided by the MIS process</td>
<td>Some support by persons from Northwest Denver</td>
</tr>
<tr>
<td></td>
<td>Strong community opposition by persons living immediately next to the I-70 alignment</td>
<td></td>
</tr>
</tbody>
</table>

b Includes $36 million for TSM elements, including additional new buses, operational improvements to I-70, and bike/pedestrian facilities.

b For major investment (LRT plus bus feeder system) only.
The CTF recommended Package 5A–LRT on the Gold Line/TSM as the preferred LPA, with the proviso that Package 5C–LRT on I-70/TSM may need to be reconsidered as their recommendation if RTD’s impending “systems analysis” indicated that the ridership projections for Package 5A–LRT on the Gold Line/TSM were much lower than anticipated. The TAC also endorsed Package 5A–LRT on the Gold Line/TSM as the draft LPA. The PAC recommended Package 5A–LRT on the Gold Line/TSM as the draft LPA, but directed staff to also present Package 5C–LRT on I-70/TSM at subsequent public meetings and open houses. This was done to ensure that the public is given additional opportunity to express their preferences concerning the two remaining LRT alternatives. Two open houses were held on the draft LPA in December, one in Arvada and one in Denver. The Arvada meeting was attended by about 70 citizens, and the Denver meeting was attended by more than 100 citizens. In both cases, an overwhelming majority supported Package 5A–LRT on the Gold Line/TSM as the recommended LPA.

Package 5A–LRT on the Gold Line/TSM was considered favorable for the following reasons:

- It received the highest levels of support during public meetings and other public involvement activities.
- It has the highest ridership levels, forecast at 14,031 daily.
- It is more than $100 million less costly than the Package 5C–LRT on I-70/TSM.
- Is represents lower user costs, at $7.98 per new user versus $12.40 for Package 5C–LRT on I-70/TSM.

Package 5A–LRT on the Gold Line/TSM results in fewer community impacts than Package 5C–LRT on I-70/TSM. All three committees agreed that Phase I is the 20-year LPA and Phase II would be implemented after the year 2020. When RTD requests an amendment of the Metro Vision 2020 Plan, it will be for Phase I only.

Description of the LPA

The LPA involves the construction of double-track LRT from DUT to Ward Road (previously referred to as Phase I of Alternative 5A-LRT), a distance of about 11 miles. As part of the LPA, it is assumed that Phase II (Ward Road to the City of Golden) would be implemented after completion of Phase I. The LPA also includes an aggressive supplementary bus program and TSM improvements, principally focused on I-70. The key elements of the LPA are described below.

Key Elements

Operating Plan

- The operating plan assumes 7.5-minute peak weekday and 15-minute off-peak service (30-minute evening). Total travel time is estimated at approximately 24 minutes to Ward Road. Phase I to Ward Road requires a total fleet of 22 light rail vehicles (LRV), including four spare vehicles. The operating plan assumes two-car consists, with nine consists (train sets) operating during peak periods. Phase I operating plans result in 50,190 car (LRV) hours and 894,000 car (LRV) miles annually.

- Phase II to Golden would assume the same operating plan and is anticipated to require a total fleet of 29 light rail vehicles (seven additional LRVs), including five spare vehicles.

- This operating plan also assumes two-car consists, with 12 consists (train sets) operating during peak periods. Phase II operating plans result in 61,600 car (LRV) hours and 1,336,000 car (LRV) miles annually.

Alignment Locations and Improvements

Right-of-Way Requirements. The alignment will require a minimum of 45 feet of ROW to maintain a 30-foot separation (centerline track to centerline of track) between noncompliant (LRT) and freight rail vehicles as mandated by
FRA. Therefore, assuming two LRT tracks and one freight track, the total combined RTD and railroad ROW requirement is 60 feet. The existing BN/SF ROW is 100 feet from Tabor Street to Lamar Street, 50 feet from Lamar Street to Harlan Street, and 66 feet from Harlan Street to Sheridan Boulevard. East of Sheridan Boulevard, the ROW increases to 100 feet. It is assumed that additional ROW will be required in the segment from Lamar Street to Harlan Street. In other areas, it is assumed that the existing freight track will be relocated to maximize the use of existing ROW.

Phase I Alignment

DUT to I-25. As shown in Figure 6-1, the alignment begins at the planned DUT Intermodal Complex as an extension of the Central Platte Valley (CPV) line on tracks 6 and 7 and proceeds to the northeast under the 20th Street viaduct and under Delgany Street. At this point, the alignment ascends on structure paralleling 23rd Street, crosses over the Consolidated Main Line (CML) and the South Platte River to just south of I-25. It should be noted that where the LRT track parallels existing freight track egressing DUT, it will be necessary to receive a waiver from the FRA for clearances. Currently, it is anticipated that the centerline-to-centerline clearances will be a nominal 15 feet, not the 30 feet currently required. If a waiver cannot be obtained, it may be necessary to relocate Delgany Street to the west to provide more clearance between the LRT and freight tracks.

I-25 to Sheridan Boulevard. At I-25, the alignment tunnels under the highway (using and expanding an existing bike tunnel) and travels at grade just east of Inca Street until approximately 500 feet south of I-70 (see Figure 6-2). At this point, the alignment ascends on aerial structure over I-70 and West 48th Avenue and continues elevated until approximately West 52nd Avenue. Just north of West 52nd Avenue the alignment crosses vacant UP Railroad property to Pecos Street, where it crosses at-grade. From near Pecos Street, the alignment parallels the BN/SF ROW and travels under I-76, where the existing bridge will need to be expanded to accommodate the required LRT clearances and on to Sheridan Boulevard.

Sheridan Boulevard to Ward Road park-n-Ride. The alignment follows the south side of the BN/SF ROW under Sheridan Boulevard to Wadsworth Boulevard, where a new grade separation would be provided. From this point, the alignment crosses Old Wadsworth Boulevard at-grade and travels south of the BN/SF ROW to just west of Tabor Street. At Tabor Street, the alignment travels southwest across open land for 0.7 mile to the Ward Road park-n-Ride. A grade separation is provided at Ward Road.

Summary of Grade Crossings

The LPA alignment would require 31 crossings as listed below for Phase I:

- 20th Street Viaduct
- Delgany Street
- Consolidated Main Line
- I-25
- West 38th Avenue
- I-70
- 48th Avenue
- 52nd Avenue
- Pecos Street
- Federal Boulevard
- Lowell Boulevard
- Tennyson Street
- Sheridan Boulevard
- Lamar Street
- Grandview Avenue
- Wadsworth Boulevard Bypass
- Vance Street
- Wadsworth Boulevard
- Allison Street
- Balsam Street
- Carr Street
- Garrison Street
- Independence Street
- Kipling Street
- State Home Road
- Miller Street
- Parfet Street
- Robb Street
Insert Figure 6-1
Insert Figure 6-2
Stations
A total of eight stations are anticipated for Phase I:

Phase I

- **Denver Union Terminal** — DUT would be modified to accommodate LRT service
- **West 38th Avenue** — A station on the east side of Inca Street at West 38th Avenue
- **Pecos Street** — A new station and park-n-Ride at Pecos Street and the BN/SF
- **Federal Boulevard** — A new station and park-n-Ride at Gold Line and Federal Boulevard
- **Sheridan Boulevard** — A new station and park-n-Ride at Gold Line and Sheridan Boulevard
- **Olde Town** — A station on the south side of Gold Line above the existing Olde Town park-n-Ride (no new parking required)
- **Ridge Home** — A station with parking on the southwest corner of Kipling Street and Gold Line
- **Ward Road** — A station in the existing park-n-Ride north of I-70 (no new parking required)

Phase II
Two additional stations are called for with Phase II:

- **McIntyre Street** — park-n-Ride at the intersection of SH 58 and McIntyre Street
- **Downtown Golden** — park-n-Ride station with two levels of structured parking on approximately 2 acres on the southeast corner of SH 58

LRT Maintenance Facility
One 10- to 20-acre light maintenance facility would be planned on the alignment. It would be ideally located in the industrial zones between Federal Boulevard and Sheridan Boulevard or between Ward Road and McIntyre Street. The following elements would be included:

- Tail tracks
- Train washing facilities
- Maintenance facilities
- Outdoor and indoor storage

Bus System Changes
The LPA bus element provides dramatically improved bus service, especially in the western portions of the study area, where service for local routes has been fortified and stops at LRT stations would be added (see Figure 6-3). skyRide bus service to DIA would be discontinued because access to the airport would be provided by the LRT service on the Gold Line to DUT with a transfer to the East Corridor commuter rail to DIA. LRT service would replace a number of express bus routes including the 58X, 68X, 72X, and 78X routes originating in the Arvada area. These routes would be replaced with feeder bus routes to the Ward Road, Ridge Home, and Olde Town Arvada stations. Some improvements are planned for Northwest Denver, but no major changes are planned because the current service there is extremely good. To improve transit service prior to the construction of Phase II of the LRT, two new park-n-Rides would be added at the Golden Central Business District and 44th/McIntyre. Specific recommendations for bus system improvements are given below.

Specific Modifications
Local Route Modifications

1. **Route 6 — East 6th Avenue/North Pecos.**
   No changes are proposed to the current routing, but a stop would be added at the West 38th Avenue and Pecos Street LRT stations for transfers to/from the LRT line.
2. **Route 17 — Jefferson County.** A stop would be added at the Golden LRT Station (Phase II).

3. **Route 31 — North Federal.** A stop would be added at the Federal LRT Station. Routing and service frequencies would be the same as Alternative 2–TSM.

4. **Route 32 — West 32nd Avenue.** Stops would be added at the Golden and McIntyre LRT stations (Phase II). Routing and service frequencies would be the same as Alternative 2–TSM.

5. **Route 38 — West 38th Avenue.** A stop would be added at the West 38th Avenue LRT Station. Routing and service frequencies would be the same as Alternative 2–TSM.

6. **Route 44 — West 44th Avenue.** Stops would be added at the McIntyre Street (Phase II) and Ward Road LRT stations. Routing and service frequencies are the same as Alternative 2–TSM.

7. **Route 51 — Sheridan Crosstown.** A stop would be added at the Sheridan Boulevard LRT Station. Routing and service frequencies would be the same as Alternative 2–TSM; however, additional service would be added between Westminster Mall and the Sheridan LRT Station. This additional service would operate at 15-minute intervals during peak periods, peak direction only. This would result in a “blended” headway with the regular Route 51 service of 10 minutes.

8. **Route 52 — West 52nd Avenue/South Pearl Street.** A stop would be added at the McIntyre Street (Phase II), Ward Road, Ridge Home, Olde Town, Federal Boulevard, Pecos Street, and West 38th Avenue LRT stations. Routing and service frequencies would be the same as Alternative 2–TSM. For Phase I, routing would terminate at the Ward Road LRT Station, western portion of route covered by extended Route 132.

9. **Route 64 — Arvada.** (The previous Route 64, Arvada Circulator, has been changed to Route 164.) A stop would be added at the McIntyre Street (Phase II) and Olde Town LRT stations. Routing and service frequencies would be the same as Alternative 2–TSM.

10. **Route 76 — Wadsworth Boulevard Crosstown.** A stop would be added at the Olde Town LRT Station. Routing and service frequencies would be the same as Alternative 2–TSM; however, additional service would be added between the Broomfield park-n-Ride and the Olde Town LRT Station. This additional service would operate at 30-minute intervals during peak periods, peak direction only. This would result in a “blended” headway with the regular Route 76 service of 10 minutes.

11. **Route 80 — West 80th Avenue Crosstown.** Terminate south end of route at the Ward Road LRT Station. Routing and service frequencies would be the same as Alternative 2–TSM.

12. **Route 100 — Kipling Street Crosstown.** Add stop at the Ridge Home LRT Station. Routing and service frequencies would be the same as Alternative 2–TSM.

13. **Route 125 — Denver West Crosstown.** Stops would be added at the Ward Road and Olde Town LRT stations. Routing and service frequencies would be the same as Alternative 2–TSM.

14. **Route 132 — 44th/McIntyre-U.S. 36/96th.** A stop would be added at the McIntyre Street LRT Station (Phase II). Routing and service frequencies would be the same as Alternative 2–TSM. For Phase I, routing would be extended east along West 52nd Avenue to Ward Road and the Ward Road LRT Station.

15. **Route 164 — Arvada Circulator (renumbered from previous Route 64).** A stop would be added at the Olde Town LRT Station. Routing would be the same as Alternative 2–TSM. Proposed service
frequencies are 15-minute peak periods, 30-minute off-peak periods.

Limited Route Modifications
1. **Route 44 Ltd. — West 44th Avenue.** The route would be turned back at the McIntyre Street LRT Station (Phase II), and a stop would be added at the Ward Road LRT Station. For Phase I, the route would be turned back at the Ward Road LRT Station, and West 44th Avenue would be covered by an extension to Route 64. (The portion of the route between Golden and McIntyre Street would be covered by Route 32.) Service frequencies would be the same as Alternative 2-TSM.

Express Route Modifications
1. **Route 6X — Ward Road/CS/I-25 & Broadway Express.** The route would be extended north to a new stop at the Ward Road LRT Station. Routing and service frequencies would be the same as Alternative 2-TSM.

2. **Route 58X — West 58th Express.** The route would be turned back at the Ridge Home LRT Station. The routing north of the Ridge Home LRT Station would be Ridge Road to Independence and would remain the same as Alternative 2-TSM for the remaining routing. Proposed service levels are 15-minute peak periods, with bi-directional service.

3. **Route 68X — North Pierce Street Express.** The route would be turned back at the Olde Town LRT Station. Proposed service levels are 15-minute peak periods, with bi-directional service.

4. **Route 70X — Ward Road – I-25/Broadway.** This route would be eliminated.

5. **Route 72X — Ward Road Express.** The route would be modified to serve West 82nd Avenue, Alkire Street, and West 72nd Avenue (Route 72 loop) before following Alternative 2-TSM routing from West 72nd Avenue/Eldridge Street to the Ward Road LRT Station where the route would terminate. Proposed service levels are 15-minute peak period, with bi-directional service.

6. **Route 75X — Olde Town/MW Express.** A stop would be added at the Olde Town LRT Station. Routing and service frequencies would be the same as Alternative 2-TSM.

7. **Route 76X — North Wadsworth Boulevard Express.** The route would be turned back at the Olde Town LRT Station. Routing and service frequencies would be the same as Alternative 2-TSM.

8. **Route 131X — Federal Boulevard/58th Avenue Express.** This route would be eliminated and replaced with LRT service to DUT.

9. **Route 144X — Golden/McIntyre Express.** This route would be eliminated and replaced with LRT service to DUT (Phase II). For Phase I, this route operates 15-minute frequencies all day between Golden and the Ward Road LRT Station.

Regional Route Modifications
1. **Route CC — Coal Creek/Wondervu.** A stop would be added at the Olde Town LRT Station. Routing and service frequencies would be the same as Alternative 2-TSM.

2. **Route G — Boulder/Golden/Federal Center.** A stop would be added at the Golden LRT Station (Phase II). Routing and service frequencies would be the same as Alternative 2-TSM.

skyRide Route Modifications
1. **Route AR — DIA/Arvada.** This route is eliminated and replaced with LRT service to DUT connecting with DMU service to DIA along the East Corridor.
Transportation Systems Management Improvements

As shown in Figure 6-4, TSM improvements for the LPA include:

- ITS improvements, including variable message signing, on I-70 from SH 58 to I-25 and ramp metering on the eastbound on-ramps of I-70 at Ward Road, Kipling Street, Wadsworth Boulevard, Sheridan Boulevard, Federal Boulevard, and Pecos Street.

- Incident management improvements on I-70 from SH 58 to I-25 including the purchase of a commercial tow-truck vehicle. Directional signage improvements at the I-76/I-25 interchange and at the I-70/I-25 interchange.

- Geometric improvements at the Pecos Street/I-70 interchange, including ramp modifications and expansion of A/D lanes between Pecos Street and Federal Boulevard.

- Increased bus service throughout the corridor as outlined above.

- Allowance for bicycle and pedestrian improvements.

Consequences of Implementing the LPA

Costs Considerations

Capital Cost

The recommended corridor investment (Phase I only) is estimated to have a total capital cost of $316 million, comprised of the following elements:

- $280 million for the LRT system
- $36 million of the TSM improvements

This cost is within the corridor budget of $320 million. Capital costs estimates in the LRA are presented in Table 6-3. Note that these costs are in addition to the $149 million recommended in the 2020 RTP for improvements to I-70 and I-76.
TABLE 6-3
Capital Cost Estimate (1997 $ Million)

<table>
<thead>
<tr>
<th>Element</th>
<th>Cost</th>
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<tbody>
<tr>
<td>ROW</td>
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<td>Guideway</td>
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<tr>
<td>Traction Power</td>
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<td>Vehicles</td>
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<tr>
<td>Buses</td>
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<tr>
<td>Maintenance Facility</td>
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<tr>
<td><strong>Total Light Rail</strong></td>
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TSM

<table>
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<tr>
<td>Pecos Street Interchange</td>
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<td>Additional Buses</td>
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<td>park-n-Rides</td>
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<td>ITS</td>
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<tr>
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<td>Signage</td>
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<td>Bike/Pedestrian Facilities</td>
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<td><strong>Total TSM</strong></td>
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<tr>
<td><strong>Total MIS LPA Capital Cost</strong></td>
<td><strong>321.0 (Rounded)</strong></td>
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Annual Operations and Maintenance Cost

The annual operating and maintenance cost (Phase I only) is estimated at $18.3 million, including:

- $11.6 million for the LRT system, including the feeder bus system
- $6.7 million for the TSM improvements, including $5.4 million for bus operations not associated with the LRT feeder system, plus $1.3 million for the O&M of I-70 operational improvements and bike/pedestrian facilities

Table 6-4 presents a breakdown of the LPA O&M costs.

TABLE 6-4
LPA Operations & Maintenance Cost (1997 $ Million)

<table>
<thead>
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<th>Element</th>
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<tr>
<td>Light Rail</td>
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<tr>
<td><strong>Total LPA</strong></td>
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Mobility Benefits

The investment (Phase I only) would provide a number of transportation benefits to the corridor in the year 2020 including:

- Reducing regional VMT by 63,000 per day
- Reducing regional person hours of delay by 8,876 per day
- Serving 14,031 users and increasing transit ridership in the corridor by 12,100 per day

The LPA represents a major public works construction program resulting in potential community impacts as well as benefits.

Community Considerations

Potential Impacts

The recommended corridor investment (Phase I only) is estimated to require acquisition of from 10 to 20 businesses and from 5 to 10 residences. Most of the potential takings are at station locations, and the number required would depend on the size and location of the station. Final determination would not take place until the Environmental Impact Statement (EIS).

Since the majority of construction would occur in the BN/SF ROW, there would be minimal other community impacts except for inconveniences during construction. Approximately 150 homesites are located within 100 feet of the alignment, and
approximately 325 homesites are located within 300 feet of the alignment.

The greatest potential for community and neighborhood impacts along the alignment occurs where the alignment is located directly in front of homes. This occurs in the following locations:

- **Along Inca Street south of I-70.** The proposed alignment would be located on the east side of Inca Street under the overhead power lines that are located to the west of the rail yards. Fewer than five residences and a number of marginal businesses are located on the west side of Inca Street from West 45th Avenue south to West 38th Avenue. The specifics of this potential impact cannot be determined until refinements of the alignment during the completion of the Preliminary Engineering (PE)/Draft EIS (DEIS).

- **Grandview Historic District.** Grandview Avenue in Arvada east of Wadsworth Bypass is an east-west street facing the railroad alignment. There is a row of historic homes on the north side of Grandview that faces the railroad. Although the street and the railroad ROW provide an estimated 50-foot separation, these homes will be subject to additional traffic, noise, and visual impacts from the transit improvements.

- **Ridge Road and Reno Drive.** These two streets located between Garrison Street and Old Wadsworth Boulevard also parallel the BN/SF ROW. Most homes back up to the railroad corridor rather than face it, but will also be subject to additional noise and visual impacts.

There are also expected to be visual impacts on those segments of the alignment that are elevated. The elevated section south of I-25 in the Central Platte Valley will be close to proposed residential development. The proposed alignment will parallel the 23rd Street Viaduct, which will mitigate this impact to a great degree.

**Benefits**

A positive community impact will be opportunities for transit-oriented development (TOD) at station locations. For Phase I, the greatest opportunities are expected to be in Olde Town Arvada and on the Ridge Home property. The City of Arvada is actively promoting Olde Town for higher-density residential development supportive of transit. The existing commercial business district is pedestrian-friendly and within walking distance of the station. The City is planning for transit-oriented mixed-use residential and commercial development on the vacant Ridge Home property. There are also potential opportunities for TOD adjacent to the West 38th Avenue Station. In Phase II, there would be opportunities for TOD at the Golden Station.

**Potential Natural Resource Impacts**

The construction of the LPA would result in approximately 110 to 120 acres disturbed (Phase I only). The majority of this acreage is located within the BN/SF ROW and is anticipated to provide little or no wildlife habitat. It is anticipated that few trees or other natural vegetation would need to be removed during construction. Fugitive dust will need to be controlled during construction to protect air quality.

There is the potential for impacts to wetlands between Tennyson Street and Federal Boulevard, where the BN/SF ROW parallels several small wetlands. Careful alignment considerations and construction techniques would need to be provided in these areas to avoid wetlands impacts. Further, the final alignment will need to be designed to avoid impacts to the Ward Road State Wildlife Area (SWA) located immediately east of Ward Road and North of I-70.

The construction of stations and the maintenance facility will increase impervious surfaces by approximately 50 acres, resulting in the potential for additional storm water runoff to local watercourses. Therefore, it will be necessary to construction storm water retention ponds to mitigate these impacts.
Implementation

The intent of this study was to use the MIS process to identify preferred transportation improvements within the Denver to Golden corridor. The recommended LPA (along with the recommended LPAs from the other three MIS corridors) will be included in the RTD 2020 Needs Based Plan. It, however, will likely not be included in the fiscally constrained RTD Transportation Systems Plan until available funding is identified within a 20-year time horizon.

Similarly, upon endorsement by the RTD Board, the LPA for the I-70 Denver to Golden MIS, along with the LPAs from the other three MIS currently under study, will be submitted to DRCOG as requested amendments to the DRCOG Metro Vision 2020 Plan. Metro Vision serves as a comprehensive guide for the future development of the region, generally reflecting the region’s desired approach to addressing future growth and the needs it creates. The LPA will not be included in the Metro Vision 2020 Regional Transportation Plan, the Fiscally Constrained Element (2020 RTP), unless or until adequate funding is identified within the 20-year planning horizon.

In DRCOG’s staff review of the recommended LPA, the project was found to be in compliance with Metro Vision’s major transportation goal of “a balanced multimodal transportation system.” The staff review also found the LPA in compliance with the Plan’s core elements and more specific land use and transportation objectives and policies.

After the Metro Vision is amended, the following implementation actions need to take place prior to development:

- Inclusion in the Metro Vision 2020 (or subsequent) Regional Transportation Plan, the Fiscally Constrained Element.
- Completion of preliminary engineering and National Environmental Policy Act (NEPA) documentation (environmental impact statement) on the proposed program of improvements.
- Final design and construction of the rail line and associated TSM improvements included in the LPA package.

The timing and sequence of these actions is contingent on available funding. It is clear the proposed transportation improvements will be needed by or before 2020. However, as of the date of this document, no funds are projected to be available through RTD or other funding sources included in the DRCOG TIP funding process within the 20-year planning horizon of the 2020 RTP. RTD has programmed its forecast funds for the construction of the Southeast Corridor projected for completion in 2007, the West Corridor projected for completion in 2014, and the East Corridor projected for completion in 2020. A number of actions could change this status as outlined below:

- Additional federal funding for transit could speed up the current planned construction schedule.
- CDOT could change its allocation of state funds making greater funding available for rail improvements.
- Other local funding could be identified.
- The electorate at either the state or metropolitan level could pass a referendum for additional funding for transportation improvements.
SECTION 7

References

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RTD. park-n-Ride Utilization Report.
APPENDIX A

Membership Lists of the Policy Advisory Committee, Technical Advisory Committee, and the Citizen’s Task Force
APPENDIX A

Membership Lists of the Policy Advisory Committee, Technical Advisory Committee, and the Citizens Task Force

Members of the Policy Advisory Committee

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<thead>
<tr>
<th>Name</th>
<th>Title</th>
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<tr>
<td>Ken Arnold</td>
<td>Senator</td>
<td>Senate District 23 – Adams County</td>
</tr>
<tr>
<td>Wade Buchanan</td>
<td>Chairman</td>
<td>Regional Air Quality Council</td>
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<td>Gretchen Cerveny</td>
<td>Mayor</td>
<td>City of Wheat Ridge</td>
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<td>Nolbert D. Chavez</td>
<td>Representative</td>
<td>House District 5 – Denver, Colorado State Capitol</td>
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<tr>
<td>Shelley J. Cook</td>
<td>Mayor Protem</td>
<td>City of Arvada</td>
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<tr>
<td>Michael F. Feeley</td>
<td>Senator</td>
<td>Senate District 21 – Jefferson County/Lakewood</td>
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<td>Dennis Gallagher</td>
<td>Councilman, District #1</td>
<td>Denver City Council</td>
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<td>Ann Ragsdale</td>
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<tr>
<td>Hal Ruth</td>
<td>Mr.</td>
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<tr>
<td>Jan C. Schenck</td>
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<tr>
<td>Ted Strickland</td>
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<td>Lois Tochtrop</td>
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<td>House District 34 – Adams County</td>
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<tr>
<td>John Witwer</td>
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<td>House District 25 – Jefferson County</td>
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RTD Board of Directors

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<td>Stephen C. Millard</td>
<td>N</td>
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<tr>
<td>Bob Briggs</td>
<td>J</td>
<td>Rosemary Paolillo</td>
<td>F</td>
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<td>Carl E. Erickson</td>
<td>E</td>
<td>Wally Pullman</td>
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<td>Dave Ruchman</td>
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<td>Loren R. Sloane</td>
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<td>A</td>
<td>Robert L. Tonsing</td>
<td>H</td>
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<tr>
<td>Dick McLean</td>
<td>O</td>
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## Members of the Technical Advisory Committee

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Gwen Anderson</td>
<td>Executive Director</td>
<td>Union Station Transport Development Company</td>
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<tr>
<td>Jack Baier</td>
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<td>Colorado Public Utilities Commission</td>
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<td>David Baskett</td>
<td>Traffic Engineer</td>
<td>City of Lakewood</td>
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<tr>
<td>Dave Beckhouse</td>
<td>Community Planner</td>
<td>Federal Transit Administration</td>
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<tr>
<td>Mike Bestor</td>
<td>City Manager</td>
<td>City of Golden</td>
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<tr>
<td>Cindy Christensen</td>
<td>Transportation Program Manager</td>
<td>Downtown Denver Partnership</td>
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<tr>
<td>Jim DiLeo</td>
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<td>Colorado Department of Health &amp; Environment</td>
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<tr>
<td>Steven J. Fender</td>
<td>Principal Regional Inspector</td>
<td>Federal Railroad Administration</td>
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<tr>
<td>Greg Fulton</td>
<td>President</td>
<td>Colorado Motor Carriers Association</td>
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<tr>
<td>Ed Gallagher</td>
<td>Division Engineer</td>
<td>Burlington Northern/Santa Fe Railroad</td>
</tr>
<tr>
<td>Bob Goebel</td>
<td>Director of Public Works</td>
<td>City of Wheat Ridge</td>
</tr>
<tr>
<td>Robert J. Gordanier</td>
<td>Mayor</td>
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<tr>
<td>Denise Harris</td>
<td>Planning Director</td>
<td>Adams County</td>
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<tr>
<td>Miller Hudson</td>
<td>Executive Director</td>
<td>Colorado Intermountain Fixed Guideway Association</td>
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<td>Ken Lloyd</td>
<td>Executive Director</td>
<td>Regional Air Quality Council</td>
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<td>Russ Mayer</td>
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<td>Gregg Mugele</td>
<td>Environmental Project Manager</td>
<td>CDOT Region 6</td>
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<td>Terry Rosapep</td>
<td>Transportation Planning Director</td>
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<td>Steve Rudy</td>
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<td>DRCOG</td>
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<td>Jim Townsend</td>
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<td>Jefferson County Highways &amp; Transportation</td>
</tr>
<tr>
<td>Don Ulrich</td>
<td>Project Manager</td>
<td>CH2M HILL</td>
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<td>Bob Watts</td>
<td>Traffic Engineer</td>
<td>City of Arvada</td>
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Members of the Citizen's Task Force

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<td>Rosella Gonzales</td>
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<td>Mark and Joann Graham</td>
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<td>Bruce Presgrave</td>
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<td>U.S. Department of Energy</td>
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<td>Joe Siccardi</td>
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<td>Nicholas Skorski</td>
<td>General Business Services</td>
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<td>Susan Stensrud</td>
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<td>Joe Williams</td>
<td>Foothills Bank</td>
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<tr>
<td>T.J. Wirth</td>
<td></td>
</tr>
<tr>
<td>Art Zamora</td>
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APPENDIX B

Documentation of Travel-Demand Model Results for the Denver to Golden I-70 MIS
Locally Preferred Alternative (LPA) Old versus New DRCOG Land-Use Data
APPENDIX B

Documentation of Travel-Demand Model Results for the Denver to Golden I-70 MIS Locally Preferred Alternative (LPA) Old versus New DRCOG Land-Use Data

1.0 Introduction

This paper presents a comparison of travel-demand forecast results for the Denver to Golden I-70 MIS Locally Preferred Alternative (LPA). The proposed LPA reflects light rail transit (LRT) service from Denver Union Terminal (DUT) to Ward Road along the BN/SF Gold Line railroad alignment. Stations are proposed at DUT, West 38th Avenue, Pecos Street, Sheridan Boulevard, Olde Town Arvada, Ridge Home, and Ward Road. If the line is eventually extended, two additional stations would be provided at McIntyre Street and in downtown Golden. The LPA also contains various TSM measures including:

- I-70 ITS improvements including variable message signing and ramp metering
- I-70 incident management improvements
- I-70 directional signage improvements
- I-70 geometric improvements at the Pecos Street/I-70 interchange
- Increased bus service throughout the corridor
- Bicycle and pedestrian improvements

Ridership forecasts were initially prepared for the LPA in July 1999. Since then, the Denver Regional Council of Governments (DRCOG) has modified the regional land-use data that determines traffic analysis zone (TAZ) trip-generation characteristics. RTD recently prepared a new travel-demand forecast for the Denver to Golden I-70 MIS using the new DRCOG land-use data. Projected year 2020 boardings for the Denver to Golden I-70 LRT line decreased from 14,031 (using the previous DRCOG land-use data) to 13,577 (using the new DRCOG land-use data).

This paper begins with a description of land-use data changes on a regional, corridor, and TAZ basis within the Denver to Golden I-70 MIS corridor. This is followed by a presentation of resulting person-trip and transit-trip impacts on a regional, corridor, and TAZ basis. Transit-assignment impacts (corridor bus and LRT) are then identified. The paper concludes with a discussion of likely reasons for changes in ridership patterns.
2.0 DRCOG Land-Use Data Changes

Regional Land-Use Forecasts

The new DRCOG land-use data reflect a significant change in 2020 population and employment forecasts on a regional basis. As shown below in Table 2.1, regional population and employment forecasts are now higher by 20.6 and 21.7 percent, respectively.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Old 2020 Forecast</th>
<th>New 2020 Forecast</th>
<th>Difference</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>2,705,693</td>
<td>3,261,953</td>
<td>556,260</td>
<td>20.6</td>
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<tr>
<td>Employment</td>
<td>1,522,900</td>
<td>1,853,537</td>
<td>330,637</td>
<td>21.7</td>
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</table>

Corridor Land-Use Forecasts

Changes within the Denver to Golden I-70 Corridor are shown in Table 2.2. Corridor population and employment forecasts are up now 12.9 and 13.1 percent, respectively.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Old 2020 Forecast</th>
<th>New 2020 Forecast</th>
<th>Difference</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>295,987</td>
<td>334,037</td>
<td>38,050</td>
<td>12.9</td>
</tr>
<tr>
<td>Employment</td>
<td>136,268</td>
<td>154,078</td>
<td>17,810</td>
<td>13.1</td>
</tr>
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</table>

Figure 2.1 illustrates the location and magnitude of change for population within and around the Denver to Golden I-70 Corridor. The column chart accompanying the figure identifies the number of study area TAZs that fall within a particular range of population difference. Of the 153 study area TAZs, 112 (73.2 percent) have minimal population differences that range between -438 and 438. The TAZs with the most significant population differences are in the Golden area (TAZs 709, 749, and 751) and between 64th and 72nd Avenues, east of Wadsworth and west of Pecos Street (TAZs 559 and 562).

Figure 2.2 illustrates differences in the employment forecasts. Most of the employment increases are located in the northeastern portion of the study area. Of the 153 study area TAZs, 140 (91.5 percent) have employment differences that range from -438 to 438. Two TAZs recorded significant changes in employment: TAZ 723, located along the Gold Line in Arvada, had an employment change of 2,430, while TAZ 748, located along Colfax Avenue east of Golden, had an employment change of 2,368.
FIGURE 2.1
Study Area Population Changes
Old versus New DRCOG Land-Use Data
FIGURE 2.2
Study Area Employment Changes
Old versus New DRCOG Land-Use Data

Range of Employment Differences

# of Study Area Zones
3.0 Person-Trip Table Impacts

Regional Person Trips
Changes in land-use data forecasts result in changes to the travel-demand model’s person-trip tables. As shown below in Table 3.1, regional person-trip forecasts are now 23.6 percent higher.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Old 2020 Forecast</th>
<th>New 2020 Forecast</th>
<th>Difference</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td>2,273,881</td>
<td>2,705,651</td>
<td>431,770</td>
<td>19</td>
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<tr>
<td>Non Work</td>
<td>8,034,873</td>
<td>10,040,703</td>
<td>2,005,830</td>
<td>25</td>
</tr>
<tr>
<td>Total Trips</td>
<td>10,308,754</td>
<td>12,746,354</td>
<td>2,437,600</td>
<td>23.6</td>
</tr>
</tbody>
</table>

Corridor Person Trips
Corridor person trips grew at a rate similar to regional person trips, as reflected in Table 3.2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Old 2020 Forecast</th>
<th>New 2020 Forecast</th>
<th>Difference</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td>223,051</td>
<td>249,411</td>
<td>26,360</td>
<td>11.8</td>
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<tr>
<td>Non Work</td>
<td>908,755</td>
<td>1,054,696</td>
<td>145,941</td>
<td>16.1</td>
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<tr>
<td>Total Trips</td>
<td>1,131,806</td>
<td>1,304,107</td>
<td>172,301</td>
<td>15.2</td>
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Figures 3.1 illustrates person-trip differences within the study corridor on a TAZ basis for work and non-work-trip purposes. These figures also identify TAZs with significant changes in person trips. The TAZs with significant variations are consistent with those posting sizeable population and employment changes. Those TAZs are generally located in the Golden and north Arvada/south Westminster areas. Some of the most substantial changes in non-work trips occurred along the Gold Line alignment in Arvada (TAZs 721 and 723, west of Wadsworth).
FIGURE 3.1
Study Area Work-Trip Changes
Old versus New DRCOG Land-Use Data
FIGURE 3.2
Study Area Non-Work-Trip Changes
Old versus New DRCOG Land-Use Data
4.0 Transit-Trip Table Impacts

Regional Transit Trips

Changes in land-use data and person-trip forecasts have also caused an adjustment in transit-trip forecasts. Much of the additional growth forecast in the new DRCOG land-use data is in the outer fringes of the region, where there is little or no transit service. This has resulted in a slight drop in the regional mode split, from 2.7 percent to 2.3 percent. As shown below in Table 4.1, regional transit-trip forecasts are higher, albeit with a lower modal shares.

<table>
<thead>
<tr>
<th>Trip Type</th>
<th>Old 2020 Forecast</th>
<th>New 2020 Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transit Trips</td>
<td>Mode Split</td>
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<tr>
<td>Work</td>
<td>137,244</td>
<td>6.0</td>
</tr>
<tr>
<td>Non Work</td>
<td>138,526</td>
<td>1.7</td>
</tr>
<tr>
<td>Total Transit Trips</td>
<td>275,770</td>
<td>2.7</td>
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</table>

Corridor Transit Trips

Changes within the Denver to Golden I-70 Corridor are shown in Table 4.2. Corridor transit-trip forecasts are higher, but there was a slight drop in the transit modal shares.

<table>
<thead>
<tr>
<th>Trip Type</th>
<th>Old 2020 Forecast</th>
<th>New 2020 Forecast</th>
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<tbody>
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<td></td>
<td>Transit Trips</td>
<td>Mode Split</td>
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<tr>
<td>Work</td>
<td>13,948</td>
<td>6.3</td>
</tr>
<tr>
<td>Non Work</td>
<td>12,068</td>
<td>0.9</td>
</tr>
<tr>
<td>Total Transit Trips</td>
<td>26,016</td>
<td>2.3</td>
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Most of the TAZ transit-trip changes within the study area are slight. Figures 4.1 and 4.2 illustrate TAZ transit-trip differences by work and non-work-trip purposes. None of the TAZs within the study area had a change in transit trips of greater than 150 trips. Those with 100-plus changes were located along Colfax Avenue in the southern portion of the study corridor.
FIGURE 4.1
Study Area Transit Work-Trip Changes
Old versus New DRCOG Land-Use Data
FIGURE 4.2
Study Area Transit Non-Work-Trip Changes
Old versus New DRCOG Land-Use Data
5.0 Transit-Assignment Forecast Impacts

Peak and off-peak period transit assignment forecasts were reviewed to determine the resulting impact from land-use and trip-table changes. Findings are as follows:

Regional Ridership Forecasts
The travel-demand model projected 481,094 regional transit boardings in 2020 under the old DRCOG land-use data. With the new land-use data, the travel-demand model projects a total ridership of 498,203, an increase of 17,109 daily boardings. Regional ridership forecasts by mode are presented in Table 5.1. Regional bus boardings grew by 4.2 percent, while regional LRT boardings rose 1.5 percent.

<table>
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<tr>
<th>Forecast</th>
<th>Old Forecast</th>
<th>New Forecast</th>
<th>Difference</th>
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<tr>
<td>Bus Boardings</td>
<td>363,729</td>
<td>379,062</td>
<td>15,333</td>
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<tr>
<td>LRT Boardings</td>
<td>117,365</td>
<td>119,141</td>
<td>1,776</td>
</tr>
<tr>
<td>Total Ridership</td>
<td>481,094</td>
<td>498,203</td>
<td>17,109</td>
</tr>
</tbody>
</table>

Denver to Golden Corridor LRT Ridership Impacts
The travel-demand model projected a 2020 ridership forecast of 14,031 on the LRT line when using the old DRCOG land-use data. With the new land-use data, the travel-demand model projects a 2020 ridership of 13,577, or a decrease of 454 daily riders. Ridership actually increased slightly in the off-peak period, but decreased in the peak period, as shown in Table 5.2. This suggests that most of the ridership loss is due to changing home-based work (HBW) trip patterns.

<table>
<thead>
<tr>
<th>Forecast</th>
<th>Old Forecast</th>
<th>New Forecast</th>
<th>Difference</th>
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</thead>
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<tr>
<td>Peak Ridership</td>
<td>10,777</td>
<td>10,259</td>
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<tr>
<td>Off-Peak Ridership</td>
<td>3,254</td>
<td>3,318</td>
<td>64</td>
</tr>
<tr>
<td>Total Ridership</td>
<td>14,031</td>
<td>13,577</td>
<td>-454</td>
</tr>
</tbody>
</table>

A review of station boardings indicates that ridership increased slightly at the Ridge Home, Olde Town Arvada, and Pecos Street stations, and decreased at all other stations. Table 5.3 presents projected daily boardings for all Denver to Golden I-70 stations.
A closer look at travel-demand model results indicates that there are fewer trip productions from the Denver to Golden I-70 Corridor that are being attracted to DUT in the new data set. This is apparent when reviewing the production-to-attraction assignments on the LRT line. There were 11,821 trips attracted to DUT on the LRT line with the old DRCOG land-use data. With new land-use data, however, a total of 10,608 trips are attracted to DUT. The decrease in trip attractions to DUT is slightly offset by trip productions at DUT. With the old land-use data, there were 647 trip productions that boarded at DUT compared to 876 trip productions with the new data. These trip productions are destined to attractions (i.e., employment) within the Denver to Golden I-70 Corridor and/or to attractions outside of the corridor that can be reached by a bus connection (e.g., U.S. 36 employment centers).

**Corridor Bus Ridership Impacts**

Bus ridership for defined Denver to Golden I-70 Corridor bus routes increased by 3,094 trips with the new DRCOG land-use data. It is important to note that this increase includes trips that begin and/or end outside of the Denver to Golden I-70 Corridor on some routes. For example, Route 30/31 has been defined as a corridor route. However, this route continues north into the U.S. 36 Corridor and south into the West Corridor, where a future light rail line is assumed. Thus, the change in boardings identified for this route includes trips that originate/terminate outside of the Denver to Golden I-70 Corridor. Table 5.3 presents bus ridership forecasts for each Denver to Golden I-70 Corridor route.
## TABLE 5.4
Denver to Golden I-70 Corridor Bus Ridership Forecasts

<table>
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<th>Forecast</th>
<th>Old Forecast</th>
<th>New Forecast</th>
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<tr>
<td>6</td>
<td>8,792</td>
<td>9,463</td>
<td>671</td>
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<tr>
<td>17</td>
<td>1,122</td>
<td>1,513</td>
<td>391</td>
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<tr>
<td>30/31</td>
<td>10,879</td>
<td>10,315</td>
<td>-564</td>
</tr>
<tr>
<td>32</td>
<td>5,407</td>
<td>5,530</td>
<td>123</td>
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<td>38</td>
<td>5,412</td>
<td>5,760</td>
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<td>72</td>
<td>2,032</td>
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<td>76</td>
<td>9,535</td>
<td>10,402</td>
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6.0 Conclusions

This paper has presented a comparison of travel-demand forecast results for the I-70 MIS Locally Preferred Alternative (LPA). Significant findings are as follows:

- The new DRCOG 2020 land-use data project increases in corridor population and employment of 12.9 and 13.1 percent, respectively, somewhat less than the forecasted average regional gains of 20.6 and 21.7 percent.

- Corridor person trips increased by 15.2 percent with the new DRCOG land-use data. Non-work trips rose 16.1 percent, to 1,054,696, while work trips increased 11.8 percent, to 249,411.

- Corridor transit trips also increased, rising 6.2 percent from 26,016 to 27,619. The transit mode share for the corridor, however, decreased from 2.3 to 2.1 percent.

- Transit assignment forecasts reflect a slight increase in regional transit boardings. Within the Denver to Golden I-70 Corridor, there is an increase in corridor-defined bus boardings, but a 3.2 percent decrease in daily corridor LRT boardings, from 14,031 to 13,577.

- A closer review of the LRT assignment indicates that there was a loss of work-related trips, but a slight increase in non-work-related trips.

- Ridership increased at Ridge Home, Olde Town Arvada, and the Pecos Street rail stations, but declined at all other corridor LRT stations.

In summary, there are more Denver to Golden I-70 Corridor transit trips with the new DRCOG land-use data, but fewer trips on the LRT line. It appears that the loss of LRT riders is attributable to a change in land-use distribution. The new DRCOG land-use data reflect greater employment outside of downtown Denver. Ridership increases on transit lines that connect to these suburban employment locations, but ridership is stagnant or declines on transit lines that connect to downtown Denver. This is evident by reviewing LRT assignment results at DUT station. There are now 1,213 fewer trips attracted to DUT with the new land-use data. As a result, person trips produced in the corridor are being distributed to other locations of the region. There are also 229 more trip productions boarding at DUT. Therefore, trips produced in other areas of the Denver region are boarding at DUT with a destination in the Denver to Golden I-70 Corridor. It is also possible that some of these additional trips are being attracted to U.S. 36 Corridor employment areas (i.e., transferring to a north/south bus route at a corridor LRT station). The change in trip distribution patterns emphasizes the need for the LRT line to have strong bus connections to employment centers located within and adjacent to the study area for service to the reverse commuter.