

Final EIS
August 2011

North I-25 EIS O&M Cost Methodology & Results Technical Memorandum

Prepared for:
Colorado
Department of Transportation

Prepared by:



Under Contract to:
Felsburg, Holt & Ullevig

Final Report
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1.0 Introduction

The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA), in cooperation with the Colorado Department of Transportation (CDOT), initiated a Draft Environmental Impact Statement (DEIS) to identify and evaluate multi-modal transportation improvements along the 61-mile I-25 transportation corridor extending from the Fort Collins/Wellington area to Denver. An extensive process was undertaken to identify a range of alternatives that could be developed to meet the purpose and need of the project. These alternatives were then screened and combined to produce two build packages. These packages, together with the No-Action Alternative, were considered the reasonable alternatives and were fully evaluated in the DEIS.

Package A includes commuter rail line using the existing BNSF railroad track from Fort Collins to downtown Longmont. Package A also includes a new commuter rail line that would connect Longmont to the FasTracks North Metro end-of-line station in Thornton. Other components of Package A include nine commuter rail stations and a commuter rail maintenance facility; commuter bus service along US 85 between Greeley and downtown Denver as well as along E-470 from US 85 to Denver International Airport (DIA) and a commuter bus maintenance facility; and feeder bus routes along five east-west routes.

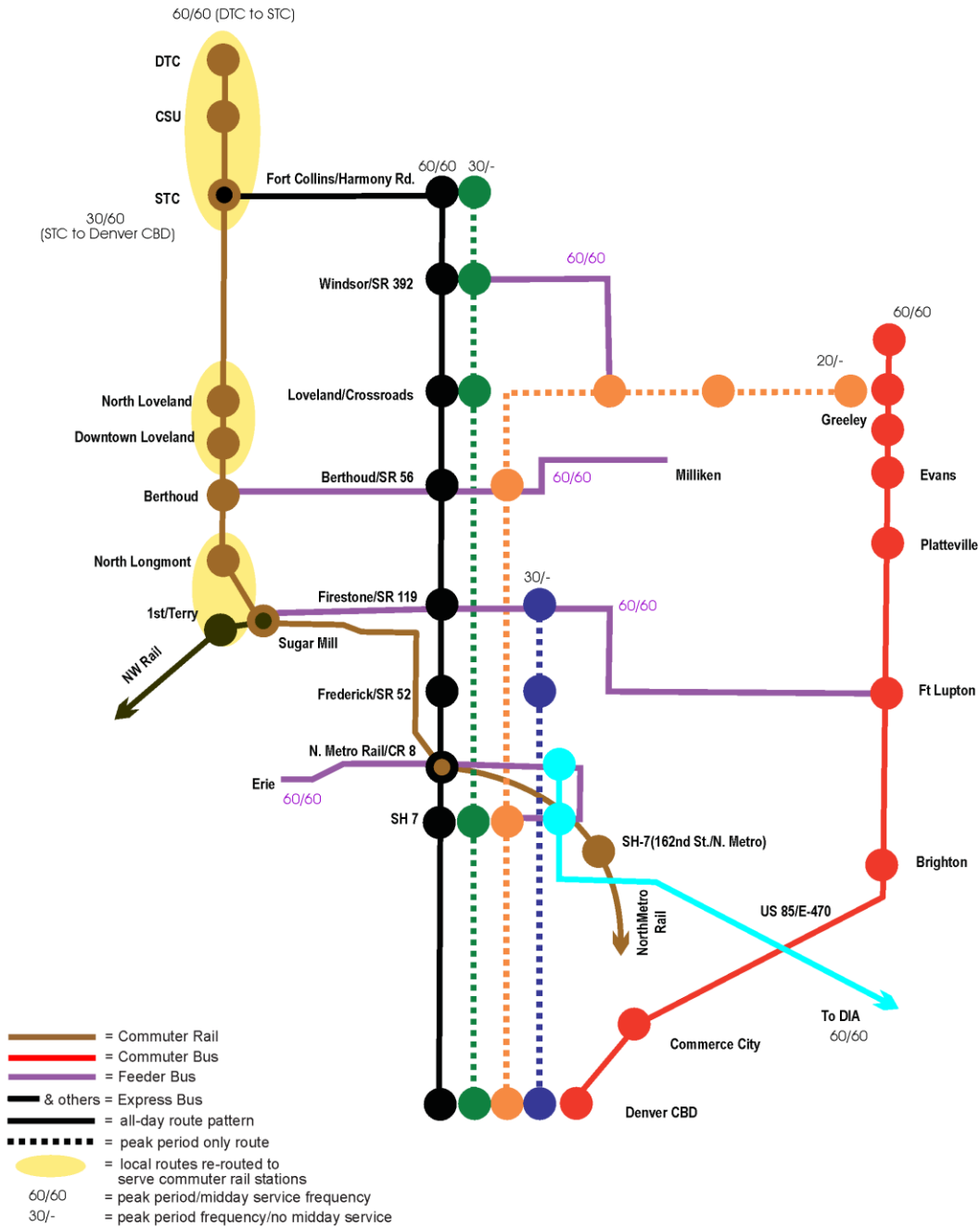
Package B includes tolled express lanes (TEL) on I-25 that would be used by buses, high-occupancy vehicles for free, and single-occupancy vehicles if they pay a toll. Package B includes 12 bus stations along I-25, US 34 into Greeley and Harmony Road into Fort Collins. Package B also includes a bus maintenance facility and feeder bus routes along five east-west streets, as well as bus service along E-470 from I-25 to DIA.

As a result of the DEIS, a Draft Committee Vision was created based on public input, travel demand model results and further analysis of the corridor. This vision includes components from both Packages A and B. Specifically, the following components are included in the Committee's Vision:

- Commuter rail along the BNSF corridor from Fort Collins to Longmont and a connection to RTD's North Metro rail line at the proposed 162nd Avenue station, with North I-25 commuter rail service continuing to Denver Union Station (DUS) in downtown Denver;
- An extension of RTD's Northwest commuter rail line from 1st/Terry in Longmont to the proposed Sugar Mill station on the North I-25 rail line;
- Commuter bus on US 85 from Greeley to downtown Denver;
- Express bus on I-25 in tolled express lanes; and
- Feeder bus connections to proposed premium transit rail and bus routes.

Figure 1-1 provides a schematic of the proposed transit network in the Draft Committee Vision Plan for the North I-25 corridor, as refined through subsequent analysis.

Figure 1-1
Draft Committee Vision – Proposed Transit Network and Operating Plan
Preferred Alternative Operating Plan



In the prior DEIS work, annual O&M costs were estimated by using the following three costing methods:

- Local and feeder bus service that uses conventional buses were estimated with an hourly service cost based on a “blended hourly rate of North Front Range providers (Greeley (The Bus), Fort Collins (Transfort) and Loveland (COLT)).
- For premium bus service, such as regional commuter and express bus services, a higher hourly service cost was applied based on RTD’s hourly rate for bus service.
- For commuter rail, cost data from Virginia Railway Express (VRE) was primarily used as the basis for estimating costs.

For all three methods, FY 2003 National Transit Database (NTD) cost data (the most current data available at the time), was used, with costs inflated to 2005 dollars.

This report presents new cost methodologies, followed by O&M cost estimates for the Draft Committee Vision.

2.0 O&M Cost Methodology

As noted in the Introduction, annual O&M cost estimates in the DEIS were developed through application of three applications. Local/feeder bus cost estimates were based on hourly service costs for North Front Range bus operators. Premium service (express and commuter bus) cost estimates were based on hourly service costs for RTD. Commuter rail cost estimates were based primarily on Virginia Railway Express (VRE) cost data.

Data used at the time of the DEIS was based on 2003 cost information, with unit costs inflated to 2005 dollars. For this current work effort, bus O&M unit costs have been updated with 2008 National Transit Database (NTD) figures (the most current year available), with those unit costs inflated to 2009 dollars.

Methodology used to estimate commuter rail O&M costs has also been modified. At the time of the DEIS, the specific mode of commuter rail operation in the RTD FasTracks Plan was unknown. Work completed for the North I-25 DEIS project assumed traditional locomotive-hauled commuter rail operations for the project's commuter rail service alternative. Now, it is known that the North Metro rail line will be operated with Electric Multiple Units (EMU's), and that North I-25 service will likely be Diesel Multiple Units (DMU's) that also operate on North Metro's alignment. RTD has completed detailed O&M costing of EMU and DMU service in its FasTracks planning efforts. Therefore, this updated methodology uses cost information that is consistent with RTD's FasTracks planning efforts.

2.1 Local and Feeder Bus Service

The preferred alternative assumes four new feeder bus services. To estimate the cost of the feeder bus service, a representative cost per revenue vehicle hour was developed, using a weighted average of the three local operators serving this region: Fort Collins, Loveland and Greeley.

As shown in Table 2-1, the cost per revenue vehicle hour was calculated for each of the three local operators in the study area, based on the 2008 NTD data. This is the same methodology used in the DEIS phase of this project. The calculated cost per revenue vehicle hour was then adjusted to 2009 dollars, based on a factor derived from the Bureau of Labor Statistics Consumer Price Index (CPI) for the Western Urban Region by comparing the July 2008 index to the July 2009 index). In this case, 2008 costs were deflated by 1.96% to adjust for 2009. Each operator's hourly costs were weighted according to their proportional share of revenue hours. The resulting weighted cost per revenue vehicle hour of \$83.12 (2009 dollars) is 20.7 percent higher than the 2005 estimate of \$68.85 that was used in the DEIS phase of this project.

Table 2-1
Summary of Local Operators' Cost per Revenue Vehicle Hour

Operator	2005 Estimate	2008 NTD Data			Cost per Revenue Vehicle Hour			% Change (from 2005 est.)
		Cost	Revenue Hours	% Hours	2008 Dollars	2009 Dollars	Weighted	
Greeley, CO - The Bus	\$ 14.67	\$ 1,946,565	30,348	28.4%	\$ 64.14	\$ 62.89	\$ 17.87	21.8%
Fort Collins, CO - Transfort	\$ 50.82	\$ 6,463,845	68,358	64.0%	\$ 94.56	\$ 92.71	\$ 59.32	16.7%
Loveland, CO - COLT	\$ 3.36	\$ 646,067	8,120	7.6%	\$ 79.56	\$ 78.01	\$ 5.93	76.5%
Total	\$ 68.85		106,826	100.0%			\$ 83.12	20.7%

Notes:

1. Adjustment to 2009 dollars based on factor of July 2008 to July 2009 Bureau of Labor Statistics Consumer Price Index for the Western Urban Region
2. 2009 Weighted Average based on percentage of hours.

2.2 Premium Bus Service

A higher unit rate was used for commuter and express bus route service. Methodology used for estimating premium bus service is the same as applied in the DEIS. RTD's 2008 NTD cost data was used to arrive at an hourly service cost of \$103.46 (2008 dollars). This figure was then adjusted to 2009 dollars using the same method described for local and feeder bus service. The resulting 2009 rate is \$101.43 per revenue bus-hour. This is an 11.9 percent increase over the 2005 estimate of \$90.64 that was used in the DEIS phase of this project.

Table 2-2
Summary of RTD's Cost per Revenue Vehicle Hour

Operator	2005 Estimate	2008 NTD Data		Cost per Revenue Vehicle Hour		% Change (from 2005 est.)
		Cost	Revenue Hours	2008 Dollars	2009 Dollars	
RTD - Denver, CO	\$ 90.64	\$ 292,088,992	2,823,339	\$ 103.46	\$ 101.43	11.9%

Note: Adjustment to 2009 dollars based on factor of July 2008 to July 2009 Bureau of Labor Statistics Consumer Price Index for the Western Urban Region

2.3 O&M Cost for Rail Service

Specific operating arrangements for North I-25 commuter rail service are undetermined at this time. Operating arrangements will be required with BNSF for use of its track between Longmont and Fort Collins. It must be determined who will operate train service, maintain vehicles, track and stations. In addition to those issues, North I-25 rail service, as presently envisioned, necessitates service coordination and cost-sharing arrangements with RTD, for the proposed North I-25 rail service will be operating on RTD's proposed North Metro alignment. This project also includes an extension of RTD's proposed Northwest rail line.

At this current phase in the project, more is known about proposed RTD's FasTracks operations on the Northwest and North Metro rail lines. Thus, the methodology for estimating rail O&M costs has been updated to reflect RTD cost information when appropriate. Some elected cost elements are based on cost data from Tri-Rail operations in South Florida, based on Tri-Rail's 2008 NTD submittal. Tri-Rail was chosen as a peer system since its operating arrangement is similar to what is anticipated for North I-25 service. Also, Tri-Rail operates some FRA-compliant DMU trains.

RTD O&M unit costs for the Northwest and North Metro rail lines have been calculated, based on O&M cost estimates documented in RTD's *Commuter Rail Operations and Maintenance Cost Estimate Report* dated September 4, 2009. Rail O&M unit costs for the North I-25 project has been structured in a format similar to RTD's projected DMU/EMU rail O&M costs, and is as follows:

- **Rolling Stock Operations** – North I-25 train service is likely to be contracted to a private operator. Available cost data from the 2007 NTD for South Florida RTA (Tri-Rail) reflects an average rate of \$316.36 per revenue train-hour for contracted train operations and professional/technical services (rate from 2008 was not deflated to 2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Propulsion Power** – RTD's O&M cost estimates for Northwest Corridor DMU service reflects an average cost of \$1.47 per revenue car-mile for propulsion power costs (2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Rolling Stock Maintenance** – RTD's O&M cost estimates for Northwest Corridor DMU rail service reflects an average cost of \$1.32 per revenue car-mile for rolling stock maintenance (2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **TES Maintenance** – RTD's O&M cost estimates for North Metro EMU service reflects an average cost of \$55,573 per route-mile for track electrification system (TES) maintenance (2009 dollars). The North I-25 rail project will not add any additional track-miles that require TES maintenance.
- **Track & Signal Maintenance** – RTD's O&M cost estimates for the Northwest rail corridor's track & signal maintenance average \$86,593 per route-mile (2009 dollars). The Northwest rail line assumes shared BNSF freight and passenger rail service along portions of the alignment which is similar to what is proposed for North I-25 rail service. Therefore, this unit cost is proposed for use in the North I-25 rail O&M cost estimate.
- **Station & Rev. Equipment Maintenance** – RTD's O&M cost estimates for North Metro rail station maintenance reflects an average cost of \$69,750 per station (2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Dispatch** – RTD's cost estimate for dispatch averages \$625,500 for all commuter rail lines, which works out to about \$4,475 per route-mile (2009 dollars). Since North I-25 rail service will require dispatch functions for both BSNF and passenger rail service, this unit cost was doubled (\$8,950 per route-mile).
- **Insurance** – North I-25 rail service will be different from RTD rail service, in that it's likely to be administered by an oversight agency, with train operations contracted to a private operator. Thus, insurance costs are likely to be different than what was assumed in the RTD cost estimation work. Tri-Rail insurance cost characteristics were used for estimating North I-25 insurance costs. Unit costs were developed on the basis of route-miles and train-hours, resulting in unit costs of \$12,667 per route-mile and \$35.56 per revenue train-hour.

- **CRMF Facilities Maintenance** – RTD’s annual O&M cost estimate for maintenance of the proposed CRMF rail facility is \$2,553,582. This works out to an average of \$41,900 per peak car. This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Contract Management Fees** – A 10% contract management fee has been assumed, with that rate applied to all costs except insurance.
- **General Administration** – Finally, there will be some general administrative costs for the North I-25 rail service oversight agency. Tri-Rail’s general administrative costs average 28.94% of all other costs. This rate is proposed for use in the North I-25 rail O&M cost estimate.

Table 2-3 presents proposed unit costs for the North I-25 rail project. This table presents three sets of unit costs:

- RTD unit costs for North Metro EMU rail service, since this project’s operating plan reflects replacement of ½ of North Metro rail service with North I-25 rail service;
- RTD unit costs for Northwest DMU, since these are applied to the proposed extension of Northwest DMU from 1st/Terry to Sugar Mill; and
- North I-25 DMU rail service, as described above.

**Table 2-3
Proposed Unit Costs for North I-25, Northwest DMU and
RTD North Metro O&M Cost Estimates**

Line Item Cost	Driving Variable	N. Metro RTD Rate	Northwest DMU Rate	I-25 Rate	Notes
Rolling Stock Operations	TRNHR	\$115.80	\$106.59	\$316.36	I-25 rate based on Tri-Rail cost data.
Propulsion Power	CARMI	\$0.91	\$1.47	\$1.47	I-25 rate based on RTD NW DMU O&M data.
Rolling Stock Maintenance	CARMI	\$2.07	\$1.32	\$1.32	I-25 rate based on NW DMU data
TES Maintenance	RTMILE	\$55,573	n/a	\$0	
Track & Signal Maintenance	RTMILE	\$81,209	\$86,593	\$86,593	I-25 rate based on NW DMU data
Station & Rev. Equip. Maint.	STATION	\$69,750	\$77,500	\$69,750	I-25 rate consistent with N. Metro.
Dispatch	RTMILE	\$4,475	\$3,877	\$8,950	I-25 rate reflects doubling of RTD rate.
Insurance	TRAINHR	\$14.60	\$19.52	\$35.56	I-25 rate based on Tri-Rail cost data.
	RTEMILE	\$21,177	\$20,581.19	\$12,667	
CRMF Facilities Maint.	PKVEH	\$41,900	\$41,900	\$41,900	I-25 rate based on RTD cost estimate.
Contract Mgmt. Fees	% of Op/Maint. \$	n/a	n/a	10.0%	10% applied to all costs except insurance.
General Administration	% of Total Costs	n/a	2.04%	28.94%	I-25 rate based on Tri-Rail cost data.

3.0 O&M Cost Results

Estimated bus and rail service statistics for the North I-25 project were used to estimate O&M costs, using the methodology described in Section 2.0 of this Technical Memorandum. The total incremental O&M costs for the preferred alternative is about \$40.9 million in 2009 dollars. This cost is broken out as follows:

Table 3-1
Summary of O&M Cost Estimates (Over No-Action Alternative)
for North I-25 Draft Committee Vision Plan (in 2009 Dollars)

Service Type	Annual O&M Cost Estimate (2009 Dollars, in millions)
Feeder Bus Service	\$ 2.03
Express/Commuter Bus Service	\$ 7.19
Subtotal Bus	\$ 9.22
North I-25 DMU Rail Service	\$ 35.26
RTD Northwest Rail Service Extension	\$ 0.43
North Metro Rail Service Reduction	\$ (3.97)
Subtotal Rail	\$ 31.72
Annual O&M Cost Estimate (Bus and Rail)	\$ 40.94

Estimated costs by bus service type are broken out by route in Table 3-2. Table 3-3 provides relevant service statistics used to produce rail line item costs itemized in Table 3-4. For North I-25 rail service, it is important to note that RTD's estimated costs for North Metro EMU service is \$13.3 million, and that this project's rail operating plan is estimated to reduce that cost by nearly \$4 million. It is also important to note that the statistics and costs are based on operating characteristics defined for the North I-25 packages, and are not the same as those previously defined in the FasTracks systems planning effort.

Table 3-2
North I-25 Bus Service Statistics and O&M Cost Estimates by Route
(in 2009 Dollars)

Bus Route	Peak Buses	Fleet Buses	Annual Revenue Bus Miles	Annual Revenue Bus Hours	Annual O&M Cost (2009 Dollars)
I-25 EXPRESS BUS ROUTES					
CR 8 & SH 7 to DIA	2	2	209,700	8,130	\$ 824,600
Fort Collins STC to Downtown Denver	3	4	653,100	16,520	\$ 1,675,600
Fort Collins/Harmony Rd. to Downtown Denver	5	6	195,300	7,620	\$ 772,900
Greeley to Downtown Denver	9	11	575,100	13,720	\$ 1,391,600
Firestone/SR 119 to Downtown Denver	3	4	132,000	4,570	\$ 463,500
US 85 COMMUTER BUS					
Greeley to Downtown Denver	5	6	474,600	20,320	\$ 2,061,100
Subtotal Express/Commuter Bus	27	33	2,239,800	70,880	\$ 7,189,300
LOCAL FEEDER ROUTES					
Windsor - Greeley	1	1	85,700	4,060	\$ 337,500
Milliken - Johnstown - Berthoud	1	1	122,700	4,060	\$ 337,500
Ft. Lupton-Firestone-Longmont	2	3	86,200	8,130	\$ 675,800
Firestone - Frederick - Erie	2	3	169,900	8,130	\$ 675,800
Subtotal Feeder Bus	6	8	464,500	24,380	\$ 2,026,600
TOTAL BUS	33	41	2,704,300	95,260	\$ 9,215,900

Notes: Express and commuter bus O&M costs based on RTD hourly rate of \$101.43 in 2009 dollars.

Local feeder bus O&M costs based on blended operator rate of \$83.12 in 2009 dollars.

Fleet buses based on 20% spares (rounded on a route-by-route basis).

Table 3-3
North I-25 Rail Service Statistics by Route

Rail Service	RTD N. Metro	Northwest Ext. ¹	N I-25	Total
Peak Rail Cars	9	0	24	33
Peak Trains	3	0	8	11
Annual Revenue Train Hours	17,590	0	30,940	48,530
Annual Revenue Car Hours	44,360	0	83,300	127,660
Annual Revenue Car Miles	908,000	88,300	2,756,580	3,752,880
Route Miles	18.55	1.55	48.71	68.81
Stations	8	0	9	17
Maintenance Facilities	0.25	0.00	1.00	1.25

¹ Northwest Extension includes incremental statistics only. No incremental stations since counted under North I-25 statistics.

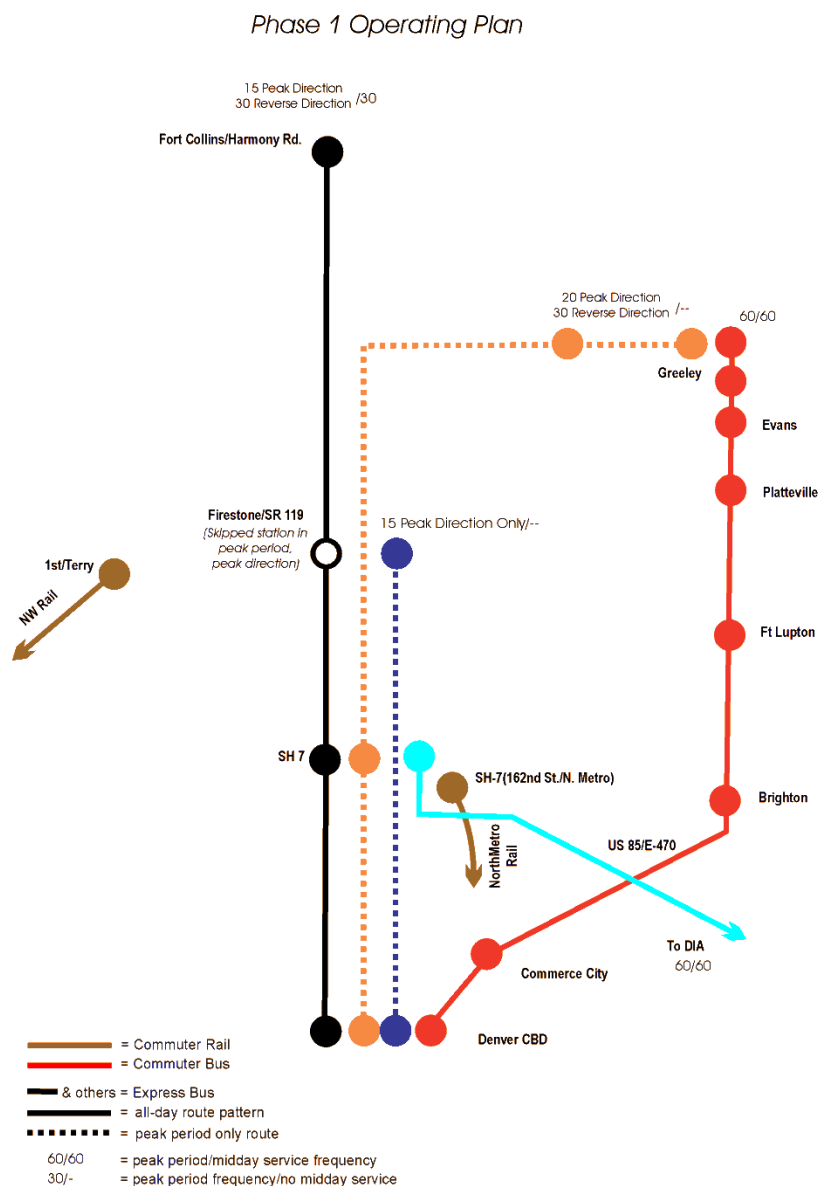
**Table 3-4
North I-25 Rail O&M Cost Estimates
(in 2009 Dollars)**

Line Item Cost	Driving Variable	Northwest			N. Metro RTD Cost	Northwest Ext. Cost	N. I-25 Cost	Total Cost
		N. Metro RTD Rate	DMU Rate	I-25 Rate				
Rolling Stock Operations	TRNHR	\$115.80	\$106.59	\$316.36	\$2,036,882	\$0	\$9,788,094	\$11,824,976
Propulsion Power	CARMI	\$0.91	\$1.47	\$1.47	\$824,148	\$129,578	\$4,045,196	\$4,869,343
Rolling Stock Maintenance	CARMI	\$2.07	\$1.32	\$1.32	\$1,883,372	\$116,500	\$3,636,938	\$5,520,310
TES Maintenance	RTMILE	\$55,573	n/a	\$0	\$1,030,883	n/a	\$0	\$1,030,883
Track & Signal Maintenance	RTMILE	\$81,209	\$86,593	\$86,593	\$1,506,430	\$134,219	\$4,217,956	\$5,724,386
Station & Rev. Equip. Maint.	STATION	\$69,750	\$77,500	\$69,750	\$558,000	\$0	\$627,750	\$1,185,750
Dispatch	RTMILE	\$4,475	\$3,877	\$8,950	\$83,011	\$6,009	\$435,955	\$518,966
Insurance	TRAINHR	\$14.60	\$19.52	\$35.56	\$256,875	\$0	\$1,100,256	\$1,357,131
	RTEMILE	\$21,177	\$20,581.19	\$12,667	\$392,834	\$31,901	\$617,011	\$1,009,845
CRMF Facilities Maint.	PKVEH	\$41,900	\$41,900	\$41,900	\$377,097	\$0	\$1,005,591	\$1,382,688
Contract Mgmt. Fees	% of Op/Maint. \$	n/a	n/a	10.0%	\$0	\$0	\$1,870,669	\$1,870,669
General Administration	% of Total Costs	n/a	2.04%	28.94%	\$379,060	\$8,525	\$7,913,557	\$8,292,617
TOTAL COSTS					\$9,328,592	\$426,732	\$35,258,973	\$45,014,297
<i>No-Action</i>					\$13,297,115			
Difference from No-Action					-\$3,968,523	\$426,732	\$35,258,973	\$31,717,182

4.0 Phase 1 O&M Cost Results

Given the long-term timeframe for expected implementation of the preferred alternative operating plan, different phases of implementation were developed for the North I-25 project. Phase 1 involves widening I-25 in various sections, various interchange replacements and upgrades, commuter rail right of way preservation, and initial I-25 express bus and US 85 commuter bus services with selective stops. Figure 4-1 illustrates elements of the Phase 1 bus operating plan.

Figure 4-1
Phase 1 – Proposed Transit Network and Operating Plan



Annual O&M costs were calculated for the Phase 1 bus plan, using the same methodology described for the full project. Operating costs are estimated at about \$7.8 million annually. Results by route are presented in Table 4-1.

Table 4-1
Phase 1 Bus Service Statistics and O&M Cost Estimates by Route
(in 2009 Dollars)

Bus Route	Peak Buses	Fleet Buses	Annual Revenue Bus Miles	Annual Revenue Bus Hours	Annual O&M Cost (2009 Dollars)
I-25 EXPRESS BUS ROUTES					
CR 8 & SH 7 to DIA	1	1	198,500	4,060	\$ 411,800
Fort Collins/Harmony Rd. to Downtown Denver	11	13	1,209,300	33,790	\$ 3,427,300
Greeley to Downtown Denver	11	13	475,600	16,760	\$ 1,700,000
Firestone/SR 119 to Downtown Denver	4	5	116,800	6,100	\$ 618,700
US 85 COMMUTER BUS					
Greeley to Downtown Denver	4	5	466,000	16,260	\$ 1,649,300
TOTAL BUS	31	37	2,466,200	76,970	\$ 7,807,100

Notes: Express and commuter bus O&M costs based on RTD hourly rate of \$101.43 in 2009 dollars.
Fleet buses based on 20% spares (rounded on a route-by-route basis).

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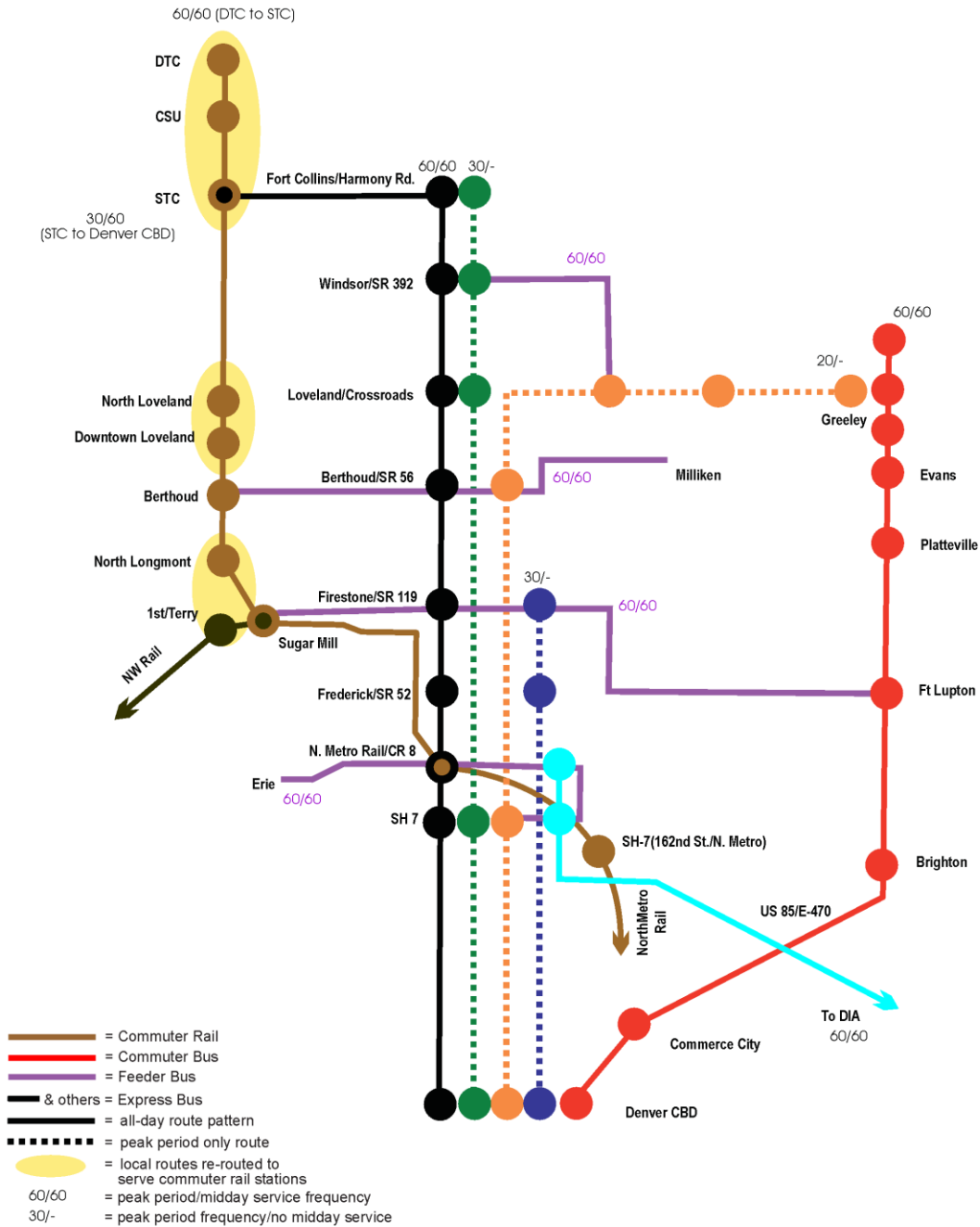
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This report presents new cost methodologies, followed by O&M cost estimates for the Draft Committee Vision.

2.0 O&M Cost Methodology

As noted in the Introduction, annual O&M cost estimates in the DEIS were developed through application of three applications. Local/feeder bus cost estimates were based on hourly service costs for North Front Range bus operators. Premium service (express and commuter bus) cost estimates were based on hourly service costs for RTD. Commuter rail cost estimates were based primarily on Virginia Railway Express (VRE) cost data.

Data used at the time of the DEIS was based on 2003 cost information, with unit costs inflated to 2005 dollars. For this current work effort, bus O&M unit costs have been updated with 2008 National Transit Database (NTD) figures (the most current year available), with those unit costs inflated to 2009 dollars.

Methodology used to estimate commuter rail O&M costs has also been modified. At the time of the DEIS, the specific mode of commuter rail operation in the RTD FasTracks Plan was unknown. Work completed for the North I-25 DEIS project assumed traditional locomotive-hauled commuter rail operations for the project's commuter rail service alternative. Now, it is known that the North Metro rail line will be operated with Electric Multiple Units (EMU's), and that North I-25 service will likely be Diesel Multiple Units (DMU's) that also operate on North Metro's alignment. RTD has completed detailed O&M costing of EMU and DMU service in its FasTracks planning efforts. Therefore, this updated methodology uses cost information that is consistent with RTD's FasTracks planning efforts.

2.1 Local and Feeder Bus Service

The preferred alternative assumes four new feeder bus services. To estimate the cost of the feeder bus service, a representative cost per revenue vehicle hour was developed, using a weighted average of the three local operators serving this region: Fort Collins, Loveland and Greeley.

As shown in Table 2-1, the cost per revenue vehicle hour was calculated for each of the three local operators in the study area, based on the 2008 NTD data. This is the same methodology used in the DEIS phase of this project. The calculated cost per revenue vehicle hour was then adjusted to 2009 dollars, based on a factor derived from the Bureau of Labor Statistics Consumer Price Index (CPI) for the Western Urban Region by comparing the July 2008 index to the July 2009 index). In this case, 2008 costs were deflated by 1.96% to adjust for 2009. Each operator's hourly costs were weighted according to their proportional share of revenue hours. The resulting weighted cost per revenue vehicle hour of \$83.12 (2009 dollars) is 20.7 percent higher than the 2005 estimate of \$68.85 that was used in the DEIS phase of this project.

Table 2-1
Summary of Local Operators' Cost per Revenue Vehicle Hour

Operator	2005 Estimate	2008 NTD Data			Cost per Revenue Vehicle Hour			% Change (from 2005 est.)
		Cost	Revenue Hours	% Hours	2008 Dollars	2009 Dollars	Weighted	
Greeley, CO - The Bus	\$ 14.67	\$ 1,946,565	30,348	28.4%	\$ 64.14	\$ 62.89	\$ 17.87	21.8%
Fort Collins, CO - Transfort	\$ 50.82	\$ 6,463,845	68,358	64.0%	\$ 94.56	\$ 92.71	\$ 59.32	16.7%
Loveland, CO - COLT	\$ 3.36	\$ 646,067	8,120	7.6%	\$ 79.56	\$ 78.01	\$ 5.93	76.5%
Total	\$ 68.85		106,826	100.0%			\$ 83.12	20.7%

Notes:

1. Adjustment to 2009 dollars based on factor of July 2008 to July 2009 Bureau of Labor Statistics Consumer Price Index for the Western Urban Region
2. 2009 Weighted Average based on percentage of hours.

2.2 Premium Bus Service

A higher unit rate was used for commuter and express bus route service. Methodology used for estimating premium bus service is the same as applied in the DEIS. RTD's 2008 NTD cost data was used to arrive at an hourly service cost of \$103.46 (2008 dollars). This figure was then adjusted to 2009 dollars using the same method described for local and feeder bus service. The resulting 2009 rate is \$101.43 per revenue bus-hour. This is an 11.9 percent increase over the 2005 estimate of \$90.64 that was used in the DEIS phase of this project.

Table 2-2
Summary of RTD's Cost per Revenue Vehicle Hour

Operator	2005 Estimate	2008 NTD Data		Cost per Revenue Vehicle Hour		% Change (from 2005 est.)
		Cost	Revenue Hours	2008 Dollars	2009 Dollars	
RTD - Denver, CO	\$ 90.64	\$ 292,088,992	2,823,339	\$ 103.46	\$ 101.43	11.9%

Note: Adjustment to 2009 dollars based on factor of July 2008 to July 2009 Bureau of Labor Statistics Consumer Price Index for the Western Urban Region

2.3 O&M Cost for Rail Service

Specific operating arrangements for North I-25 commuter rail service are undetermined at this time. Operating arrangements will be required with BNSF for use of its track between Longmont and Fort Collins. It must be determined who will operate train service, maintain vehicles, track and stations. In addition to those issues, North I-25 rail service, as presently envisioned, necessitates service coordination and cost-sharing arrangements with RTD, for the proposed North I-25 rail service will be operating on RTD's proposed North Metro alignment. This project also includes an extension of RTD's proposed Northwest rail line.

At this current phase in the project, more is known about proposed RTD's FasTracks operations on the Northwest and North Metro rail lines. Thus, the methodology for estimating rail O&M costs has been updated to reflect RTD cost information when appropriate. Some elected cost elements are based on cost data from Tri-Rail operations in South Florida, based on Tri-Rail's 2008 NTD submittal. Tri-Rail was chosen as a peer system since its operating arrangement is similar to what is anticipated for North I-25 service. Also, Tri-Rail operates some FRA-compliant DMU trains.

RTD O&M unit costs for the Northwest and North Metro rail lines have been calculated, based on O&M cost estimates documented in RTD's *Commuter Rail Operations and Maintenance Cost Estimate Report* dated September 4, 2009. Rail O&M unit costs for the North I-25 project has been structured in a format similar to RTD's projected DMU/EMU rail O&M costs, and is as follows:

- **Rolling Stock Operations** – North I-25 train service is likely to be contracted to a private operator. Available cost data from the 2007 NTD for South Florida RTA (Tri-Rail) reflects an average rate of \$316.36 per revenue train-hour for contracted train operations and professional/technical services (rate from 2008 was not deflated to 2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Propulsion Power** – RTD's O&M cost estimates for Northwest Corridor DMU service reflects an average cost of \$1.47 per revenue car-mile for propulsion power costs (2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Rolling Stock Maintenance** – RTD's O&M cost estimates for Northwest Corridor DMU rail service reflects an average cost of \$1.32 per revenue car-mile for rolling stock maintenance (2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **TES Maintenance** – RTD's O&M cost estimates for North Metro EMU service reflects an average cost of \$55,573 per route-mile for track electrification system (TES) maintenance (2009 dollars). The North I-25 rail project will not add any additional track-miles that require TES maintenance.
- **Track & Signal Maintenance** – RTD's O&M cost estimates for the Northwest rail corridor's track & signal maintenance average \$86,593 per route-mile (2009 dollars). The Northwest rail line assumes shared BNSF freight and passenger rail service along portions of the alignment which is similar to what is proposed for North I-25 rail service. Therefore, this unit cost is proposed for use in the North I-25 rail O&M cost estimate.
- **Station & Rev. Equipment Maintenance** – RTD's O&M cost estimates for North Metro rail station maintenance reflects an average cost of \$69,750 per station (2009 dollars). This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Dispatch** – RTD's cost estimate for dispatch averages \$625,500 for all commuter rail lines, which works out to about \$4,475 per route-mile (2009 dollars). Since North I-25 rail service will require dispatch functions for both BSNF and passenger rail service, this unit cost was doubled (\$8,950 per route-mile).
- **Insurance** – North I-25 rail service will be different from RTD rail service, in that it's likely to be administered by an oversight agency, with train operations contracted to a private operator. Thus, insurance costs are likely to be different than what was assumed in the RTD cost estimation work. Tri-Rail insurance cost characteristics were used for estimating North I-25 insurance costs. Unit costs were developed on the basis of route-miles and train-hours, resulting in unit costs of \$12,667 per route-mile and \$35.56 per revenue train-hour.

- **CRMF Facilities Maintenance** – RTD’s annual O&M cost estimate for maintenance of the proposed CRMF rail facility is \$2,553,582. This works out to an average of \$41,900 per peak car. This rate is proposed for use in the North I-25 rail O&M cost estimate.
- **Contract Management Fees** – A 10% contract management fee has been assumed, with that rate applied to all costs except insurance.
- **General Administration** – Finally, there will be some general administrative costs for the North I-25 rail service oversight agency. Tri-Rail’s general administrative costs average 28.94% of all other costs. This rate is proposed for use in the North I-25 rail O&M cost estimate.

Table 2-3 presents proposed unit costs for the North I-25 rail project. This table presents three sets of unit costs:

- RTD unit costs for North Metro EMU rail service, since this project’s operating plan reflects replacement of ½ of North Metro rail service with North I-25 rail service;
- RTD unit costs for Northwest DMU, since these are applied to the proposed extension of Northwest DMU from 1st/Terry to Sugar Mill; and
- North I-25 DMU rail service, as described above.

**Table 2-3
Proposed Unit Costs for North I-25, Northwest DMU and
RTD North Metro O&M Cost Estimates**

Line Item Cost	Driving Variable	N. Metro RTD Rate	Northwest DMU Rate	I-25 Rate	Notes
Rolling Stock Operations	TRNHR	\$115.80	\$106.59	\$316.36	I-25 rate based on Tri-Rail cost data.
Propulsion Power	CARMI	\$0.91	\$1.47	\$1.47	I-25 rate based on RTD NW DMU O&M data.
Rolling Stock Maintenance	CARMI	\$2.07	\$1.32	\$1.32	I-25 rate based on NW DMU data
TES Maintenance	RTMILE	\$55,573	n/a	\$0	
Track & Signal Maintenance	RTMILE	\$81,209	\$86,593	\$86,593	I-25 rate based on NW DMU data
Station & Rev. Equip. Maint.	STATION	\$69,750	\$77,500	\$69,750	I-25 rate consistent with N. Metro.
Dispatch	RTMILE	\$4,475	\$3,877	\$8,950	I-25 rate reflects doubling of RTD rate.
Insurance	TRAINHR	\$14.60	\$19.52	\$35.56	I-25 rate based on Tri-Rail cost data.
	RTEMILE	\$21,177	\$20,581.19	\$12,667	
CRMF Facilities Maint.	PKVEH	\$41,900	\$41,900	\$41,900	I-25 rate based on RTD cost estimate.
Contract Mgmt. Fees	% of Op/Maint. \$	n/a	n/a	10.0%	10% applied to all costs except insurance.
General Administration	% of Total Costs	n/a	2.04%	28.94%	I-25 rate based on Tri-Rail cost data.

3.0 O&M Cost Results

Estimated bus and rail service statistics for the North I-25 project were used to estimate O&M costs, using the methodology described in Section 2.0 of this Technical Memorandum. The total incremental O&M costs for the preferred alternative is about \$40.9 million in 2009 dollars. This cost is broken out as follows:

**Table 3-1
Summary of O&M Cost Estimates (Over No-Action Alternative)
for North I-25 Draft Committee Vision Plan (in 2009 Dollars)**

Service Type	Annual O&M Cost Estimate (2009 Dollars, in millions)
Feeder Bus Service	\$ 2.03
Express/Commuter Bus Service	\$ 7.19
Subtotal Bus	\$ 9.22
North I-25 DMU Rail Service	\$ 35.26
RTD Northwest Rail Service Extension	\$ 0.43
North Metro Rail Service Reduction	\$ (3.97)
Subtotal Rail	\$ 31.72
Annual O&M Cost Estimate (Bus and Rail)	\$ 40.94

Estimated costs by bus service type are broken out by route in Table 3-2. Table 3-3 provides relevant service statistics used to produce rail line item costs itemized in Table 3-4. For North I-25 rail service, it is important to note that RTD's estimated costs for North Metro EMU service is \$13.3 million, and that this project's rail operating plan is estimated to reduce that cost by nearly \$4 million. It is also important to note that the statistics and costs are based on operating characteristics defined for the North I-25 packages, and are not the same as those previously defined in the FasTracks systems planning effort.

Table 3-2
North I-25 Bus Service Statistics and O&M Cost Estimates by Route
(in 2009 Dollars)

Bus Route	Peak Buses	Fleet Buses	Annual Revenue Bus Miles	Annual Revenue Bus Hours	Annual O&M Cost (2009 Dollars)
I-25 EXPRESS BUS ROUTES					
CR 8 & SH 7 to DIA	2	2	209,700	8,130	\$ 824,600
Fort Collins STC to Downtown Denver	3	4	653,100	16,520	\$ 1,675,600
Fort Collins/Harmony Rd. to Downtown Denver	5	6	195,300	7,620	\$ 772,900
Greeley to Downtown Denver	9	11	575,100	13,720	\$ 1,391,600
Firestone/SR 119 to Downtown Denver	3	4	132,000	4,570	\$ 463,500
US 85 COMMUTER BUS					
Greeley to Downtown Denver	5	6	474,600	20,320	\$ 2,061,100
Subtotal Express/Commuter Bus	27	33	2,239,800	70,880	\$ 7,189,300
LOCAL FEEDER ROUTES					
Windsor - Greeley	1	1	85,700	4,060	\$ 337,500
Milliken - Johnstown - Berthoud	1	1	122,700	4,060	\$ 337,500
Ft. Lupton-Firestone-Longmont	2	3	86,200	8,130	\$ 675,800
Firestone - Frederick - Erie	2	3	169,900	8,130	\$ 675,800
Subtotal Feeder Bus	6	8	464,500	24,380	\$ 2,026,600
TOTAL BUS	33	41	2,704,300	95,260	\$ 9,215,900

Notes: Express and commuter bus O&M costs based on RTD hourly rate of \$101.43 in 2009 dollars.

Local feeder bus O&M costs based on blended operator rate of \$83.12 in 2009 dollars.

Fleet buses based on 20% spares (rounded on a route-by-route basis).

Table 3-3
North I-25 Rail Service Statistics by Route

Rail Service	RTD N. Metro	Northwest Ext. ¹	N I-25	Total
Peak Rail Cars	9	0	24	33
Peak Trains	3	0	8	11
Annual Revenue Train Hours	17,590	0	30,940	48,530
Annual Revenue Car Hours	44,360	0	83,300	127,660
Annual Revenue Car Miles	908,000	88,300	2,756,580	3,752,880
Route Miles	18.55	1.55	48.71	68.81
Stations	8	0	9	17
Maintenance Facilities	0.25	0.00	1.00	1.25

¹ Northwest Extension includes incremental statistics only. No incremental stations since counted under North I-25 statistics.

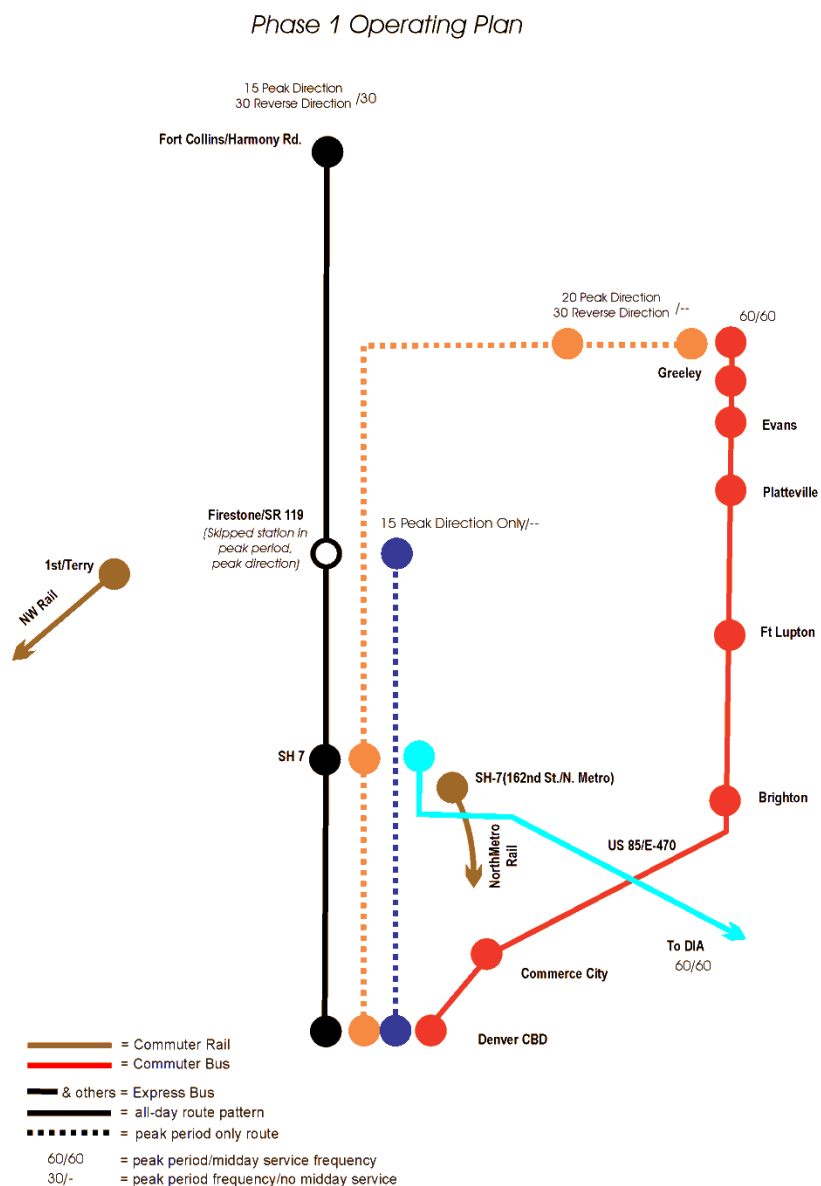
Table 3-4
North I-25 Rail O&M Cost Estimates
(in 2009 Dollars)

Line Item Cost	Driving Variable	Northwest			N. Metro RTD Cost	Northwest Ext. Cost	N. I-25 Cost	Total Cost
		N. Metro RTD Rate	DMU Rate	I-25 Rate				
Rolling Stock Operations	TRNHR	\$115.80	\$106.59	\$316.36	\$2,036,882	\$0	\$9,788,094	\$11,824,976
Propulsion Power	CARMI	\$0.91	\$1.47	\$1.47	\$824,148	\$129,578	\$4,045,196	\$4,869,343
Rolling Stock Maintenance	CARMI	\$2.07	\$1.32	\$1.32	\$1,883,372	\$116,500	\$3,636,938	\$5,520,310
TES Maintenance	RTMILE	\$55,573	n/a	\$0	\$1,030,883	n/a	\$0	\$1,030,883
Track & Signal Maintenance	RTMILE	\$81,209	\$86,593	\$86,593	\$1,506,430	\$134,219	\$4,217,956	\$5,724,386
Station & Rev. Equip. Maint.	STATION	\$69,750	\$77,500	\$69,750	\$558,000	\$0	\$627,750	\$1,185,750
Dispatch	RTMILE	\$4,475	\$3,877	\$8,950	\$83,011	\$6,009	\$435,955	\$518,966
Insurance	TRAINHR	\$14.60	\$19.52	\$35.56	\$256,875	\$0	\$1,100,256	\$1,357,131
	RTEMILE	\$21,177	\$20,581.19	\$12,667	\$392,834	\$31,901	\$617,011	\$1,009,845
CRMF Facilities Maint.	PKVEH	\$41,900	\$41,900	\$41,900	\$377,097	\$0	\$1,005,591	\$1,382,688
Contract Mgmt. Fees	% of Op/Maint. \$	n/a	n/a	10.0%	\$0	\$0	\$1,870,669	\$1,870,669
General Administration	% of Total Costs	n/a	2.04%	28.94%	\$379,060	\$8,525	\$7,913,557	\$8,292,617
TOTAL COSTS					\$9,328,592	\$426,732	\$35,258,973	\$45,014,297
<i>No-Action</i>					\$13,297,115			
Difference from No-Action					-\$3,968,523	\$426,732	\$35,258,973	\$31,717,182

4.0 Phase 1 O&M Cost Results

Given the long-term timeframe for expected implementation of the preferred alternative operating plan, different phases of implementation were developed for the North I-25 project. Phase 1 involves widening I-25 in various sections, various interchange replacements and upgrades, commuter rail right of way preservation, and initial I-25 express bus and US 85 commuter bus services with selective stops. Figure 4-1 illustrates elements of the Phase 1 bus operating plan.

Figure 4-1
Phase 1 – Proposed Transit Network and Operating Plan



Annual O&M costs were calculated for the Phase 1 bus plan, using the same methodology described for the full project. Operating costs are estimated at about \$7.8 million annually. Results by route are presented in Table 4-1.

Table 4-1
Phase 1 Bus Service Statistics and O&M Cost Estimates by Route
(in 2009 Dollars)

Bus Route	Peak Buses	Fleet Buses	Annual Revenue Bus Miles	Annual Revenue Bus Hours	Annual O&M Cost (2009 Dollars)
I-25 EXPRESS BUS ROUTES					
CR 8 & SH 7 to DIA	1	1	198,500	4,060	\$ 411,800
Fort Collins/Harmony Rd. to Downtown Denver	11	13	1,209,300	33,790	\$ 3,427,300
Greeley to Downtown Denver	11	13	475,600	16,760	\$ 1,700,000
Firestone/SR 119 to Downtown Denver	4	5	116,800	6,100	\$ 618,700
US 85 COMMUTER BUS					
Greeley to Downtown Denver	4	5	466,000	16,260	\$ 1,649,300
TOTAL BUS	31	37	2,466,200	76,970	\$ 7,807,100

Notes: Express and commuter bus O&M costs based on RTD hourly rate of \$101.43 in 2009 dollars.
Fleet buses based on 20% spares (rounded on a route-by-route basis).

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