

CO AND PM₁₀ CONFORMITY DETERMINATION

for the
DRCOG Fiscally Constrained
2040 Regional Transportation Plan

and the
Amended 2012-2017 Transportation Improvement Program
and 2016-2021 Transportation Improvement Program

Adopted April 15, 2015

Denver Regional Council of Governments
1290 Broadway, Suite 700
Denver, CO 80203

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ABSTRACT

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Fiscally Constrained 2040 Regional Transportation Plan
and the Amended 2012-2017 Transportation Improvement
Program and 2016-2021 Transportation Improvement
Program

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ABSTRACT: Demonstration of the Denver region's timely implementation of
adopted Transportation Control Measures and meeting of
federally prescribed air pollution emissions tests.

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CHAPTER 1. INTRODUCTION

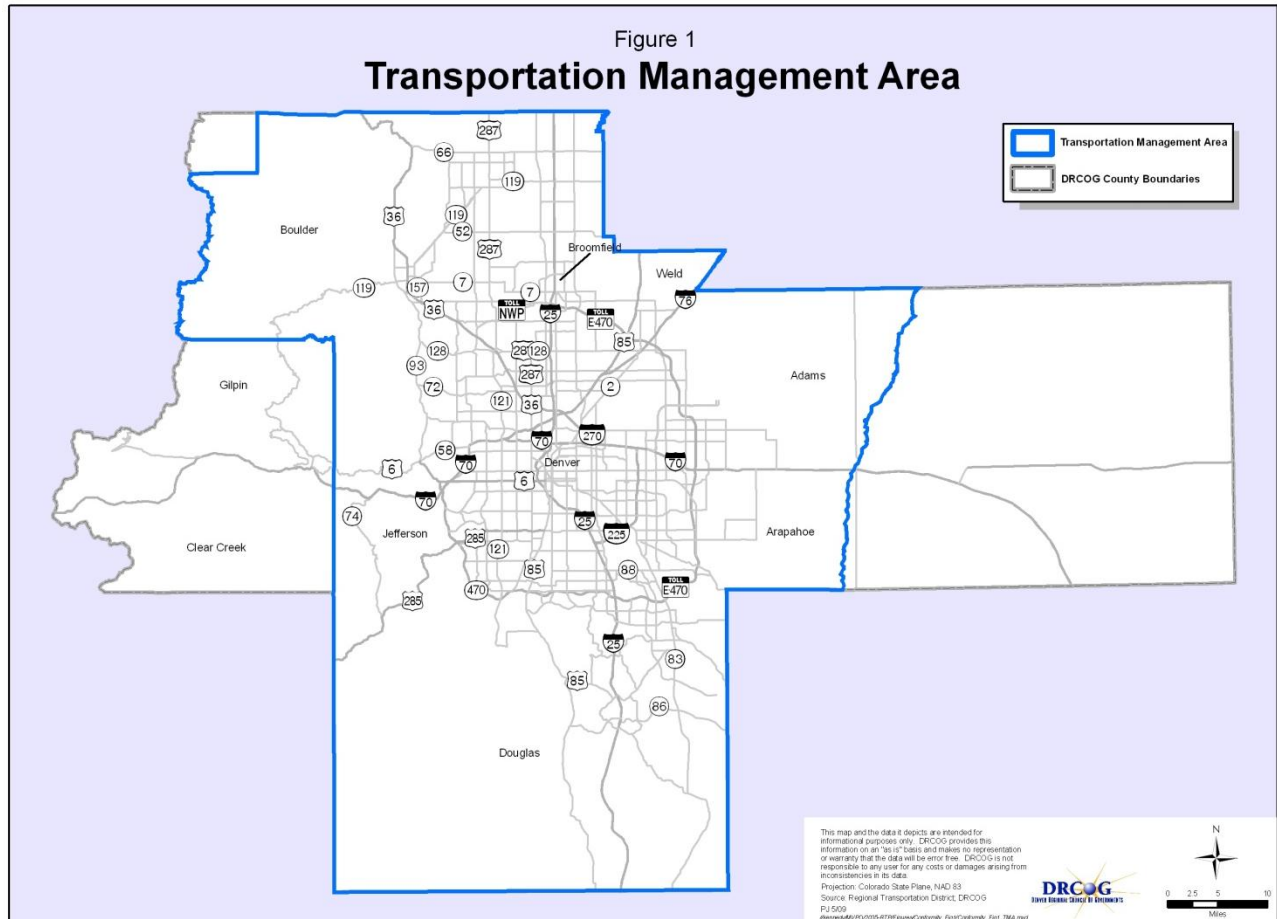
Federal Requirements

The Denver Regional Council of Governments (DRCOG) is the Metropolitan Planning Organization (MPO) for the Denver Transportation Management Area (TMA). Figure 1 displays the TMA that now includes southwestern Weld County as approved by the Governor on February 21, 2008. The MPO is required to show conformity of its fiscally constrained transportation plan and Transportation Improvement Program (TIP) with the State Implementation Plan (SIP) for air quality before these transportation plans and programs are adopted. This action is required under Section 176(c) of the Clean Air Act, as amended in 1990. Conformity to an air quality implementation plan is defined in the Clean Air Act as conformity to the implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards. In addition, activities may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with the timely attainment of required emissions reductions towards attainment. For pollutants for which a region currently meets standards but was formerly in nonattainment, the applicable SIP may also be referred to as a maintenance plan, which demonstrates continued attainment of the standards.

The U.S. Environmental Protection Agency (EPA) final transportation conformity rule is located at 40 CFR Part 93. To address revised standards and changes in conformity requirements, EPA has promulgated several amendments to the final rule in recent years. On July 1, 2004, EPA issued amendments which addressed:

- Conformity regulations for the 8-hour ozone and fine particulate matter (PM_{2.5}) NAAQS.
- The incorporation of existing federal guidance that is consistent with a U.S. Court of Appeals decision.
- The streamlining and improving of EPA's existing transportation conformity rule¹.

¹ 40 CFR Part 93



On March 10, 2006, EPA issued revisions addressing PM_{2.5} and PM₁₀ Hot-Spot Analyses in Project-Level Transportation Conformity Determinations. These project-level conformity analyses are the responsibility of project sponsors. This conformity finding covers plan and program level conformity only.

On January 24, 2008 the U. S. Department of Transportation and EPA issued the transportation conformity rule, "Transportation Conformity Rule Amendments To Implement Provisions Contained in the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)." No changes to the process DRCOG uses in developing conformity documentation were necessary to comply with the transportation conformity rule.

On March 8, 2012, EPA issued amendments which restructure several sections of the existing transportation conformity rule. Key elements of the amendments include:

- Restructuring two sections of the conformity rule, 40 CFR 93.109 and 93.119, so that the existing rule requirements clearly apply to areas designated for future new or revised

NAAQS, thus reducing the need to amend the transportation conformity rule merely to reference specific new NAAQS.

- As a result of these changes, the conformity rule will apply to any new NAAQS that EPA establishes in the future.

The EPA criteria and procedures vary according to the status of the State Air Quality Implementation Plans for individual pollutants. Transportation plans and programs must satisfy different criteria depending on whether the state has submitted a SIP revision, and whether the EPA has approved such a submittal.

In addition to the emissions tests, the region must demonstrate timely implementation of adopted Transportation Control Measures (TCMs). The transportation community is held responsible for implementing TCMs to which the state committed in the various pollutant SIPs.

Current Situation

Transportation Planning

DRCOG Region

The Metro Vision Plan is the long-range growth and development strategy for the Denver region. It integrates plans for growth and development, transportation, and environmental quality into a single comprehensive foundation for regional planning. Metro Vision calls for a balanced multimodal surface transportation system including rapid transit, a regional bus network, a regional beltway, bicycle and pedestrian facilities, and improvements to the existing roadway system.

The Metro Vision Regional Transportation Plan (MVRTP) is the transportation plan that implements the transportation element of Metro Vision. The MVRTP contains an unconstrained vision plan, outlining the region's total transportation needs, as well as the Fiscally Constrained RTP, which includes those projects that can be implemented given the anticipated level of funding. The 2035 MVRTP was first adopted on December 19, 2007 and last amended in April 2014. The Fiscally Constrained 2040 RTP will be adopted in February 2015.

DRCOG is in the process of preparing a new 2040 MVRTP – with anticipated adoption in mid-2015.

The 2012-2017 Transportation Improvement Program (TIP), first adopted in March 2011, identifies transit, multimodal, and roadway projects to be funded with FY 2012 through FY 2015 federal funds. The 2016-2021 TIP (and associated projects) is scheduled for adoption in March 2015. The current and future TIPs together will implement the Fiscally Constrained 2040 RTP.

Air Quality Planning

The status of air quality planning is important as it determines the emissions tests that must be met to find conformity.

The latest revision to the carbon monoxide (CO) maintenance plan for Longmont established the emissions budget at 43 tons per day (tpd) for 2010 and beyond. On May 3, 2007, EPA found the revised CO budget of 43 tpd “adequate” for use in conformity determinations. EPA’s approval of this latest Longmont CO Maintenance Plan revision became effective on October 16, 2007.

The most recent revised CO maintenance plan for Denver, approved by the Colorado Air Quality Control Commission (AQCC) on December 15, 2005, established the emission budget at 1,625 tpd through 2020, and 1,600 tpd for 2021 and beyond. On May 3, 2007, EPA found the revised CO budget of 1,600 tpd adequate for use in conformity determinations for 2021 and beyond. EPA’s approval of the revised Denver CO Maintenance Plans became effective on October 16, 2007.

The State of Colorado submitted the latest Denver particulate matter equal to and less than 10 microns in aerodynamic diameter (PM₁₀) maintenance plan to the EPA in December 2005. EPA approved this latest PM₁₀ SIP Revision on January 7, 2008. This latest PM₁₀ Maintenance Plan revision contains the PM₁₀ budgets of 54 tpd and 55 tpd for the years 2015 through 2021, and 2022 and beyond, respectively, as well as the wintertime NO_x budgets of 70 tpd and 56 tpd for the years 2015 through 2021, and 2022 and beyond, respectively.

On December 14, 2012, EPA strengthened the annual PM_{2.5} standard from 15 to 12 micrograms per cubic meter (µg/m³) and retained the 24-hour PM_{2.5} standard of 35 µg/m³. The agency also retained the existing standard for PM₁₀. EPA anticipates making initial attainment/nonattainment designations by December 2014, with those designations likely becoming effective in early 2015. Based on the existing PM_{2.5} monitor data, the Denver region does not violate either the new annual PM_{2.5} standard, or the existing 24-hour PM_{2.5} standard.

Air Quality Situation

The region has been redesignated as attainment maintenance for CO and PM₁₀. The pollutants and their violation status for the Denver region include:

Carbon Monoxide – A violation of the carbon monoxide standard occurs when a monitoring station shows more than one exceedance per year of the 8-hour (9 parts per million (ppm)) or 1-hour (35 ppm) standard. The carbon monoxide standard was last violated in 1995. There has been no violation for CO in the Denver region since.

PM_{2.5} – An exceedance of the PM_{2.5} standard occurs when a monitoring station exceeds the annual average of 12 µg/m³ or the 24-hour average of 35 µg/m³. A violation of the 24-hour standard occurs only if the 3-year average of the 98th percentile of all 24 hour readings at a monitor exceeds 35 µg/m³ or the 3-year average of the annual averages exceeds 12 µg/m³. The Denver metropolitan area has never violated either of the two standards.

PM₁₀ – An exceedance of the PM₁₀ standard occurs when a monitoring station exceeds a 24-hour average of 150 µg/m³. If the 24-hour standard is exceeded more than three times over a three-year period, it is a violation. The PM₁₀ standard was last violated on three days in 1993. There has been no violation for PM₁₀ in the Denver region since.

1-Hour Ozone – EPA made an adequacy determination of the proposed 8-hour ozone motor vehicle emissions budgets for conformity and the new budgets became effective on March 19, 2010. The 1-hour ozone budgets are no longer used for transportation conformity purposes.

Process

Agency Roles

The Conformity SIP was developed by the AQCC and adopted in 1998. It formally defines the process for finding conformity. In November / December 1998, a memorandum of agreement (MOA) was signed by the CDPHE and DRCOG for the purpose of defining the specific roles and responsibilities in conformity evaluations and findings. The EPA approved the Conformity SIP on September 21, 2001 (66FR48561). This makes the Conformity SIP federally enforceable.

DRCOG, as the MPO, and the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA), as representatives of the U.S. Department of Transportation, are

charged with determining conformity for the Denver TMA. The development of the Fiscally Constrained RTP and TIP conformity determination has been a cooperative process between the RAQC, the Air Pollution Control Division (APCD) of CDPHE, the EPA, the FHWA, the FTA, CDOT, the Regional Transportation District (RTD), and DRCOG.

Public Participation

Public participation was encouraged throughout the development of DRCOG's Fiscally Constrained 2040 RTP and associated Metro Vision 2040 Plan, and the TIPs. DRCOG has held numerous workshops, stakeholder meetings, interactive online forums, and other public participation events, as well as gathering public input through the Sustainable Communities Initiative, Listening Tour, CDOT Town Halls, and other related efforts.

CHAPTER 2. IMPLEMENTATION OF CONTROL MEASURES

Transportation Control Measures

The transportation plan and program must provide for the timely implementation of adopted Transportation Control Measures (TCM) from the applicable implementation plan. The state air quality implementation plan identified a number of TCMs that were funded and completed in past TIPs. The implementation of rail transit was a substantial TCM, first defined in the 1979 Carbon Monoxide SIP and the 1982 Ozone SIP.

The region's first segment of light rail, which opened in October 1994, provides service from the downtown area south to Broadway and I-25. The first extension of this service, the southwest corridor, from Broadway and I-25 to Mineral Avenue along Santa Fe Boulevard, opened in July 2000.

An extension of light rail service into the Platte Valley opened in April 2002. Funding came from a private-public partnership that included DRCOG, RTD, the City and County of Denver, and the private sector.

The southeast corridor light rail transit was completed in November 2006. It was the last remaining partially completed TCM. It includes light rail service along I-25 from Broadway south to Lincoln Avenue, as well as a light rail spur along I-225 from I-25 to Parker Road. With the completion of the southeast corridor, the region has 35 miles of light rail transit serving suburban and urban commuters.

Beyond the SIP measures, the Fiscally Constrained 2040 RTP, the 2012-2017 TIP, and the Draft 2016-2021 TIP continue funding for transportation demand management (TDM) actions through:

- The Regional TDM Program.
- A separate TDM pool program that supports localized efforts, including projects implemented by transportation management organizations (TMOs).

The TIPs also provides funding for the RTD FasTracks program, local bus service initiatives, bicycle/pedestrian projects, and transit station area master plans and urban center studies.

Timely Implementation Criteria

The transportation plan must meet two conditions to demonstrate timely implementation of TCMs:

- The transportation plan, in describing the envisioned future transportation system, provides for the timely completion or implementation of all TCMs in the applicable implementation plan which are eligible for funding under Title 23 USC of the Federal Transit Act, consistent with the schedule included in the applicable implementation plan.

The Fiscally Constrained 2040 RTP identifies the metropolitan transportation system of freeways, managed lanes (HOV/HOT lanes) transit facilities, travel demand actions, and operational improvements. It also contains goals, policies, and action strategies to guide the implementation of the plan. There are no remaining TCM's to be implemented. The Denver Regional Element of the State Air Quality Implementation Plan and the Fiscally Constrained 2040 RTP are consistent documents.

- Nothing in the transportation plan interferes with the implementation of any TCM in the applicable implementation plan.

The DRCOG committees and Board review the goals, policies, recommendations, and improvements identified in the Fiscally Constrained RTP. No conflicts exist with any specific requirements in commitments of the adopted SIP. The Fiscally Constrained RTP does not prohibit implementation of any SIP TCM, nor does it make it impossible to implement any SIP TCM.

TCMs contained in the SIP, but not directly related to the Fiscally Constrained RTP, given their non-facility planning nature, include the federal Motor Vehicle Emissions Control Program, Inspection and Maintenance Program, stationary source controls, display signs instructing motorists to turn off engines, warranty enforcement, and gasoline high altitude emissions research. The Fiscally Constrained 2040 RTP contains no policies that inhibit the implementation of these measures.

For a TIP to provide for the timely implementation of TCMs, three criteria must be satisfied:

- TCMs, which are eligible for funding under Title 23 USC of the Federal Transit Act, are on or ahead of the schedule established in the applicable implementation plan, or, if such TCMs are behind schedule, the MPO and DOT have determined the past obstacles to implementation have been identified and overcome.

There are no TCMs remaining from the CO or PM₁₀ SIPs.

- If TCMs have previously been programmed, but funds have not been obligated and the TCMs are behind schedule, then the TIP cannot be found to conform if the funds intended for these TCMs are reallocated to projects in the TIP other than TCMs.

This situation has not occurred. Programmed funds for TCMs have been obligated.

- Nothing in the TIP may interfere with implementation of any TCM in the applicable implementation plan.

The DRCOG committees and Board review the projects identified in the 2012-2017 TIP and Draft 2016-2021 TIP. No conflicts exist with any specific requirements or commitments of the adopted SIP. The TIP does not prohibit implementation of any SIP TCM, nor does it make it impossible to implement any SIP TCM.

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CHAPTER 3. EMISSIONS TESTS

General Description

The transportation plan and program must pass a series of emissions tests to demonstrate conformity. These emissions tests relate to the pollutants and their precursors for which the Denver region is designated as attainment-maintenance of the NAAQS.

These pollutants and precursors include:

- Carbon monoxide (CO)
- PM₁₀
- Nitrogen oxides (NO_x) as a precursor for PM₁₀ (wintertime estimate)

Each pollutant and precursor in specific geographic areas must pass a number of tests. The plan and program must respect the motor vehicle emissions budget in the applicable SIP or SIP submittal. Satisfying these tests involves demonstrating that relevant emissions in future years are less than or equal to the emissions budget established in the applicable maintenance plan. As required by 40 CFR 93.118, consistency with the motor vehicle emissions budget(s) must be demonstrated for each year for which the applicable implementation plan specifically establishes motor vehicle emissions budget(s), for the attainment year (if it is within the timeframe of the transportation plan), for the last year of the transportation plan's forecast period, and for any intermediate years as necessary so that the years for which consistency is demonstrated by analysis are no more than ten years apart.

In addition, when a maintenance plan has been submitted, emissions must be less than or equal to the motor vehicle emissions budget(s) established for the last year of the maintenance plan and any year for which the maintenance plan establishes budgets.

Applying these tests for the prescribed time periods for each of the pollutants results in 22 emissions tests as listed in Table 1². The analysis areas are shown in Figure 2.

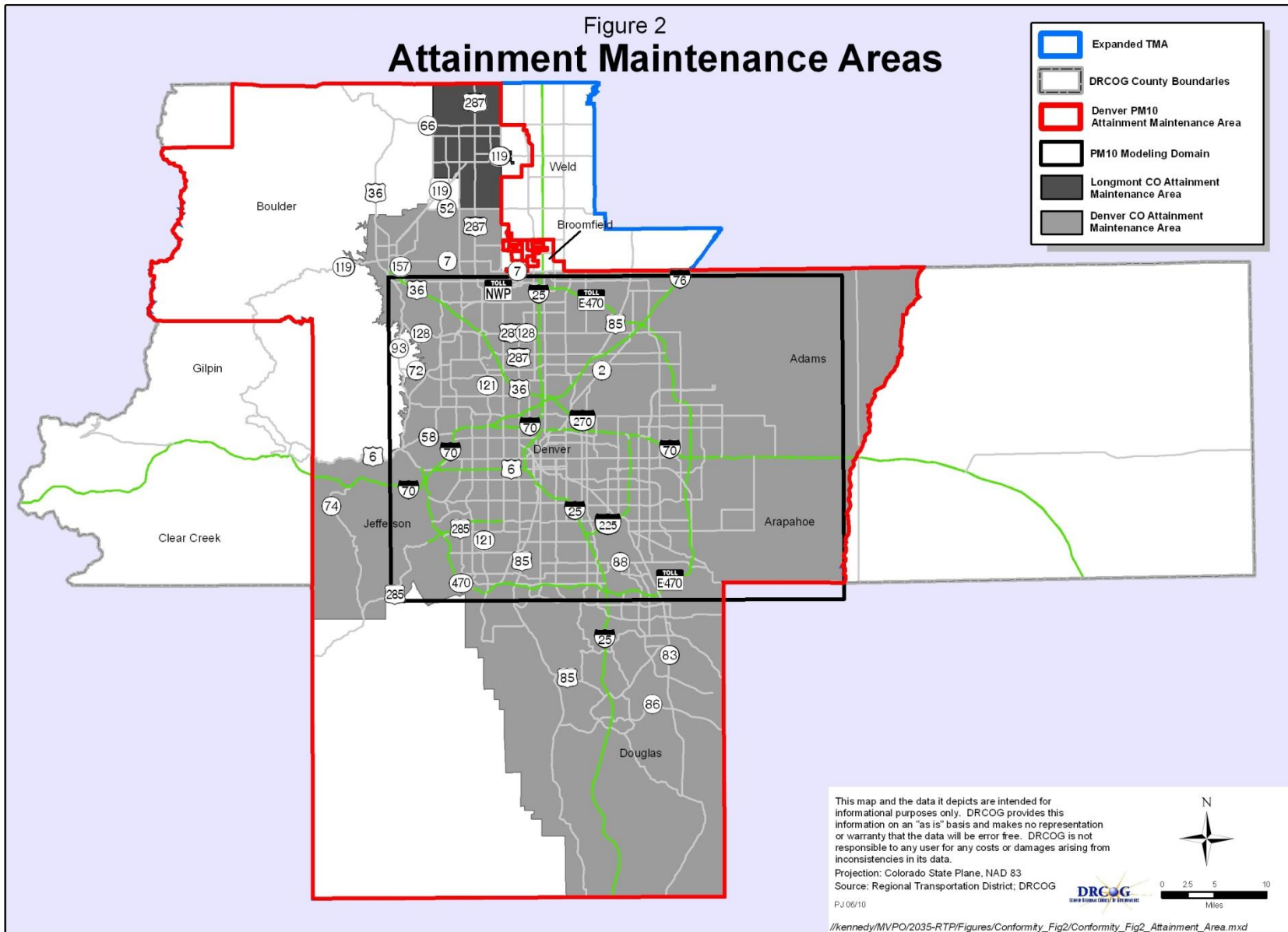
² Transportation model runs represent the beginning of a calendar year. Test dates listed in Table 1 refer to model run dates.

Table 1
Conformity Emissions Tests

Pollutant and Area	Tests
Carbon Monoxide in Denver Attainment Maintenance Area ¹	2015 staging ≤ Budget of 1,625 tpd 2021 ≤ Budget of 1,600 tpd 2025 staging ≤ Budget of 1,600 tpd 2035 staging ≤ Budget of 1,600 tpd Fiscally Constrained 2040 RTP ≤ Budget of 1,600 tpd
Carbon Monoxide in Longmont Attainment Maintenance Area ²	2015 staging ≤ Budget of 43 tpd 2020 ≤ Budget of 43 tpd 2025 staging ≤ Budget of 43 tpd 2035 staging ≤ Budget of 43 tpd Fiscally Constrained 2040 RTP ≤ Budget of 43 tpd
PM ₁₀	2015 staging ≤ Budget of 54 tpd 2022 ≤ Budget of 55 tpd 2025 staging ≤ Budget of 55 tpd 2035 staging ≤ Budget of 55 tpd Fiscally Constrained 2040 RTP ≤ Budget of 55 tpd
NO _x associated with PM ₁₀	2015 staging ≤ Budget of 70 tpd 2022 ≤ Budget of 56 tpd 2025 staging ≤ Budget of 56 tpd 2035 staging ≤ Budget of 56 tpd Fiscally Constrained 2040 RTP ≤ Budget of 56 tpd

¹ EPA approval is effective October 16, 2007.

Figure 2
Attainment Maintenance Areas



Technical Process

The technical process used to estimate future pollutant emission levels is based on the latest planning assumptions in effect at the time of this conformity determination. Assumptions behind the analysis were derived from estimates of current and future population, employment, travel, and congestion most recently developed by DRCOG. Information concerning vehicle miles traveled and operating speeds were updated as part of this conformity finding process. The above-mentioned factors were used with the EPA emission model (MOVES) to estimate emissions.

Demographic Assumptions

The population forecast for the full DRCOG region in 2040 is 4,318,208. This is an increase of 39 percent over the year 2015 estimated population of 3,113,727. Employment is forecast to be 2,361,258 in 2040 compared to the year 2015 estimate of 1,822,126, an increase of 30 percent. Growth in population and employment will be the principal factor for the increased demand for travel on the region's transportation facilities and services. Table 3 shows the latest forecasts of population and employment for 2015, 2025, 2035 and 2040 for the DRCOG region. Table 4 lists 2015 and 2040 population and employment estimates by each of the nine counties, as well as the southwest portion of Weld County within the DRCOG region.

Table 2
Population and Employment Forecasts - DRCOG Region

DRCOG Region	2015	2025	2035	2040
Population	3,113,727	3,698,247	4,149,334	4,318,208
Employment	1,822,126	2,062,972	2,260,796	2,361,258

Table 3
2040 Population and Employment
Estimates by County - DRCOG Region

County	Population		Employment	
	2015	2040	2015	2040
Adams County	493,979	772,596	228,351	345,808
Arapahoe County	618,503	852,514	350,914	509,696
Boulder County	318,791	409,329	194,597	233,112
Broomfield County	68,201	116,272	50,538	112,840
Clear Creek County	9,300	9,308	2,300	2,511
Denver County	619,989	854,660	525,473	558,196
Douglas County	314,042	446,163	148,527	228,857
Gilpin County	5,769	10,376	5,867	5,686
Jefferson County	577,866	672,601	285,717	336,034
SW Weld in DRCOG	87,287	174,389	29,842	28,518
Full DRCOG Region	3,113,727	4,318,208	1,822,126	2,361,258

Source: DRCOG. UrbanSim Modeling Run. August 9, 2014

DRCOG Transportation Assumptions

In order to complete the emissions tests, the 2015, 2025, 2035, and 2040 transportation networks must first be defined. DRCOG's Fiscally Constrained 2040 RTP specifies financially constrained highway and transit system improvements and resulting networks to be completed by the year 2040. The 2012-2017 TIP and 2016-2021 TIP identify funding to complete a number of regionally significant projects on the designated regional roadway and rapid transit system that are also contained in the Fiscally Constrained 2040 RTP, listed below:

- US-85 from Cook Ranch Road to Meadows Parkway: widen roadway to four lanes.
- I-25 from US-36 to 120th Avenue: add two HOT lanes.
- I-25 from RidgeGate Pkwy to County Line South Ramps: widen roadway to 8 lanes.
- Gold Line, Denver Union Station to Ward Road: new light rail, stations, park-n-Rides.
- I-225 Corridor, Parker Road to Smith Road: new light rail, stations, parking.

- Northwest Rail, Denver Union Station to Westminster (71st Ave Station): new rail, stations, parking.
- East Corridor, Denver Union Station to Denver International Airport: new rail, stations, and park-n-Rides.
- 120th Avenue Connection over US-36: build new six lane road.
- I-25 from Santa Fe to Alameda: interchange reconstruction.
- US-36 from the Table Mesa Park-n-Ride to the I-25 Express Lanes: add two HOT lanes, enhancements for bus rapid transit (BRT).
- I-225 from Parker Road to Mississippi Avenue: widen roadway to six lanes.

The TIPs also includes many other projects that will help to reduce emissions associated with ozone:

- Transit operating funds and bus purchases
- Bicycle and pedestrian facilities
- Travel Demand Management (TDM) programs
- Intelligent Transportation Systems (ITS) infrastructure
- Traffic signal systems and coordination
- Master plans for areas around transit stations and urban centers

Other representative regionally significant projects in the Fiscally Constrained 2040 RTP (not yet funded in the TIP) using federal and state resources include:

- Pena Boulevard from I-70 to E-470: widen roadway to eight lanes.
- Wadsworth Boulevard (SH-121) from 36th Avenue to 46th Avenue: widen roadway to six lanes.
- Wadsworth Parkway (SH-121) from 92nd Avenue to SH-128/120th Avenue: widen roadway to six lanes.
- 104th Avenue from Grandview Ponds to McKay Road: widen roadway to four lanes.
- I-70 from Brighton Boulevard to I-270: reconstruct roadway and add managed lanes.
- I-270 from I-25 to I-70: widen roadway to six lanes and reconstruct Vasquez Boulevard interchange.

- US-6 at Wadsworth Boulevard: interchange reconstruction.
- I-25 from 120th Avenue to SH-7 and from SH-66 to WCR 38: add two toll/managed lanes.
- C-470 from Wadsworth Boulevard to I-25: add toll/managed lanes.
- Colfax Avenue from 7th Street to Potomac Street: new Bus Rapid Transit.
- SH-119 from Boulder to Longmont: new Bus Rapid Transit.
- North Metro Rail Line, Denver Union Station to 124th Avenue Station: new rail, stations, parking.
- Southeast Rail Extension, Lincoln Avenue to RidgeGate Parkway: new rail, stations, parking.

Regional highway projects in the Fiscally Constrained RTP using locally-derived funds include:

- C-470 from South Kipling Parkway to I-25: add toll/managed lanes.
- E-470 from I-25/C-470 to I-25/Northwest Parkway: widen to eight/six lanes, build five new interchanges.
- New interchange at I-70/Harvest Mile Road.
- Jefferson Parkway from SH-93 to SH-128: new four-lane tollroad, plus 3 partial interchanges.

The 2015 rapid transit network includes the existing Central, Southwest, Southeast, West, and Central Platte Valley rail lines. It also includes the I-25 HOV/Tolled Express Lanes; HOV lanes on Santa Fe Drive and US 36; and bus lanes on Broadway and Lincoln. The remaining rapid transit system to be completed by 2040 is shown in Figure 3.

All roadway and rapid transit network and staging assumptions through 2040 are shown in Figures 3 and 4, respectively, in Appendix A.

DRCOG's regional travel model was used to perform the travel forecasting. A summary description of the model is included in Appendix B. A more detailed description is documented in the DRCOG *Focus* Transportation Model Documentation and in a metadata report. Additional documentation is available on the assumptions and operation of the socio-economic model. These reports and papers are available at the DRCOG offices. This model includes a number of assumptions, which are supported by current regional experience.

One set of modeling assumptions concerns transit operating policies. The model assumes that RTD will keep transit fares constant in current dollars. This is a logical assumption as RTD has an adopted policy of increasing fares in line with increases in the Consumer Price Index. Modeled fares for proposed new services are based on the most similar existing services. The model assumes that RTD would continue with its current approach in setting service levels for various areas of the region. RTD last increased its fares in January 2011.

The model assumes that the Northwest Parkway Authority and the E-470 Authority will continue to charge tolls on their facilities on a per-mile cost basis in constant dollars similar to current charges (16 cents per mile in 1996 dollars). The proposed Jefferson Parkway is assumed to have comparable tolls.

Parking costs in downtown Denver were varied using the Denver parking cost model, which uses employment density and estimates of parking supply as variables. Parking costs were established outside the Denver Central Business District by surveying current parking costs for work and non-work trips, and assuming that these would remain constant over time.

Appendix A contains the complete list of modeled transportation improvement projects within the DRCOG regional travel model.

Air Quality Modeling Assumptions

The APCD of the CDPHE calculates air pollutant emissions using MOVES. The conformity analysis began in September 2014. The models and assumptions used by APCD in the conformity analysis were consistent with those used in the development of the CO and PM₁₀ SIPs. The technical support documentation for each of these SIPs is available at <http://apcd.state.co.us/tech.aspx>.

This cycle, the vehicle fleet VMT mix, used as an input to the air quality model, was updated under the advisement of the Interagency Consultation Group (ICG), incorporating a larger and more diverse sample of vehicle-type counts. The results reflect a lower percentage of VMT by large combination trucks than in previous cycles. Additionally, for the first time, the APCD implemented the use of the EPA's updated air quality model: MOVES2014. MOVES2014 incorporates EPA Tier 3 regulations, which set new vehicle emissions standards and requires lower sulfur content in gasoline. The overall emission results are lower than previous cycles. The reductions are especially pronounced in the future staging years from 2025 to 2040 when Tier 3 regulations will be fully in effect.

Control Measures

There are several actions or projects described or assumed in the SIPs that are federally enforceable control measures. PM₁₀ street maintenance actions are one of the control measures.

PM₁₀ Street Maintenance Actions

DRCOG must demonstrate that future year estimates of PM₁₀ emissions will be less than or equal to the maintenance PM₁₀ emissions budgets to show conformity with the PM₁₀ SIP. The mobile source PM₁₀ budgets are 54 tons per day (tpd) through 2021, and 55 tpd for 2022 and beyond.

AQCC Regulation 16 is essential to the control of mobile source emissions. Adopted on August 15, 1991, the regulation has undergone several revisions, with the latest occurring on April 19, 2001. Re-entrained road dust in the Denver metropolitan area from winter street sanding causes between 40 and 60 percent of PM₁₀ emissions. It is the single largest contributor to PM₁₀ emissions³. Regulation 16 targets street sanding and sweeping practices.

³ In June 1998, the Colorado Department of Transportation, with technical assistance of Midwest Research Institute, concluded a study of the role of sand in PM₁₀ emissions. Findings from this study demonstrated that the percentage of the total PM₁₀ emissions from road traffic that consist of road dust increases from about 50 percent to as much as 80 or 90 percent during the high impact 24-hour period following road sanding. Previously, the PM₁₀ emissions analysis had been using a sand share of 33.8 percent or about half of the recent study findings. Increasing the role of sand in producing PM₁₀ emission increases the benefits of reduced street sanding. Over the past few years, local governments, CDOT, RTD and the E-470 Public Highway Authority have made major strides to reduce PM₁₀ emissions from street sand by reducing the amount of sand spread on the streets during snow storms by about 40

Since October 1, 1991, street sanding material providers have been required to meet set standards for the sanding materials they provide to state, city, and county governments. The regulation applies to both new and recycled sanding materials. All materials must meet requirements regulating their angularity, percent fines, and degree of durability. The burden of material testing to meet these standards falls on the private companies supplying the materials. An independent laboratory must conduct all testing.

Reductions in the applied amount of sanding material are also set for all of the local governments and street maintaining agencies (CDOT, RTD, E-470 Authority, Northwest Parkway Authority) within the nonattainment area. A reduction of 30 percent from their established baseline amount is mandated. Baseline amounts are typically based on 1989 practices. In the defined “foothills” area, a 20 percent reduction from the established baseline is mandated. In addition to the above requirements, there are specific requirements to the City and County of Denver and CDOT:

- The City and County of Denver shall achieve a 72% reduction within the Denver central business district (CBD). The CBD is defined as the area bounded by and inclusive of Colfax Avenue, Speer Boulevard, Wynkoop Street, 20th Street, and Broadway.
- CDOT shall achieve a 54% reduction from Interstate 25 and its entrance/exit ramps between 6th Avenue and University Boulevard.
- The City and County of Denver and CDOT shall achieve a 50% reduction on roadways within the area bounded by, and including, Federal Boulevard, Downing Street, 38th Avenue, and Louisiana Avenue.

Records and reports of the reductions and practices used must be submitted yearly to the APCD and the RAQC.

Finally, Regulation 16 sets rules for street sweeping to achieve reductions in PM₁₀ emissions. These rules include time requirements for sweeping after deployments of street sanding materials, definition of the sweeping techniques to be used, and targeted areas for increased sweeping. Record keeping and reporting of dates, equipment use, and areas swept are required under these rules.

percent from 1989 street sanding levels and increasing the sweeping of sanded streets within four days of each snow storm from none to 40 percent.

Preliminary estimates of 2035 emissions indicated that PM₁₀ emissions would be higher than the 55 tpd emissions budget after accounting for the impacts of Regulation 16. Because of this anticipated exceedance of the PM₁₀ emissions budget, local governments and road agencies were asked to provide commitments to further reduce emissions as part of the RTP update. These commitments are for additional reductions in sand application and an increase in street sweeping activities, above and beyond Regulation 16, to further reduce mobile source PM₁₀ emissions. In 2014, 40 agencies submitted their commitments to DRCOG.

Actions that can be employed to achieve PM₁₀ reductions include:

- Reducing the total amount of sanding materials used.
- Using anti-icers, deicers, and other sand substitutes in place of sanding materials.
- Street sweeping within four days of each snow event.

The local governments and agencies have decided on the combination of the above actions to meet their commitments. The street sanding and sweeping commitments made by local governments and road agencies in 2014 are detailed in Appendix C.

The Fiscally Constrained 2040 RTP identifies approximately \$90 million over a 26-year period in CMAQ and local match funds for air quality programs and purchases. Some of this \$90 million will fund additional sweeper and deicer equipment.

The PM₁₀ maintenance plan also identifies a test whereby the region must demonstrate that transportation construction emissions do not exceed those assumed in the emissions budgets. The budgets were established on the assumption that all of the facilities in the Fiscally Constrained 2020 RTP, the RTP in effect at the time the PM₁₀ SIP was adopted, would be constructed at rates of 11.4 lane-miles per year for freeways and 62.7 lane-miles per year for major regional and principal arterials. To pass the test, the rate of lane-mile construction proposed in the Fiscally Constrained 2040 RTP must be less than or equal to the rate of construction in the Fiscally Constrained 2020 RTP. The rate of construction for the Fiscally Constrained 2040 RTP is about 7.9 lane-miles per year for freeways/tollways and 31.1 lane-miles per year for major regional arterials and principal arterials. Thus, the construction emissions of the Fiscally Constrained 2035 RTP are less than the construction emissions assumed in the budgets and the test is passed.

Mobile Source Measures

The regional emissions analysis does not specifically reflect the air quality benefits of such travel demand management programs as DRCOG's Regional TDM Program, Teleworking, EcoPass, and other transportation demand management actions. In addition, other programs whose benefits are more difficult to ascertain are not fully incorporated into the model. Examples of such programs include compressed workweeks and programs initiated after 1998.

The model does include emissions reduction benefits created by the regional Traffic Signal System Improvement Program (TSSIP), which is a program in the TIP. The goal of this program is to ensure that the region's traffic signals operate in a safe manner that makes the most efficient use of arterial street capacity. The efficiency objectives include:

- Minimizing vehicle stops.
- Minimizing travel delay.
- Minimizing disruption caused by malfunctioning equipment.

The major components of the TSSIP include:

- A capital improvement program that provides intersection control equipment and installs communications links to allow signals to operate as a system.
- A program to retime signals in a coordinated fashion to improve corridor travel time through accomplishment of the above objectives.

Emission Test Results

The results of emissions tests are reported in Table 4. The emissions estimates were generated by APCD using transportation inputs and emissions models. The test results do not indicate any failures in the horizon years of the program or plan that would lead to a finding of non-conformity.

The emissions test results for the Denver region are below all of the budgets listed in Table 4.

Table 4
Conformity Emissions Test Results

Pollutant and Area	Test	Result<Budget (tons per day)	Pass/Fail
Carbon Monoxide in Denver Attainment Maintenance Area	2015 Staging \leq Budget	524.4 < 1,625	Pass
	2021 Staging \leq Budget ⁴	359.4 < 1,600	Pass
	2025 Staging \leq Budget	249.4 < 1,600	Pass
	2035 Staging \leq Budget	182.9 < 1,600	Pass
	Fiscally Constrained 2040 RTP \leq Budget	187.4 < 1,600	Pass
Carbon Monoxide in Longmont Attainment Maintenance Area	2015 Staging \leq Budget	11.8 < 43	Pass
	2020 Staging \leq Budget ⁵	8.5 < 43	Pass
	2025 Staging \leq Budget	5.2 < 43	Pass
	2035 Staging \leq Budget	4.0 < 43	Pass
	Fiscally Constrained 2040 RTP \leq Budget	4.1 < 43	Pass
PM ₁₀	2015 Staging \leq Budget	31.9 < 54	Pass
	2022 Staging \leq Budget ⁶	29.7 < 55	Pass
	2025 Staging \leq Budget	28.8 < 55	Pass
	2035 Staging \leq Budget	30.8 < 55	Pass
	Fiscally Constrained 2040 RTP \leq Budget	29.4 < 55	Pass
NO _x associated with PM ₁₀	2015 Staging \leq Budget	62.5 < 70	Pass
	2022 Staging \leq Budget ⁷	38.5 < 56	Pass
	2025 Staging \leq Budget	28.2 < 56	Pass
	2035 Staging \leq Budget	15.5 < 56	Pass
	Fiscally Constrained 2040 RTP \leq Budget	14.7 < 56	Pass

⁴ 2021 derived from interpolation of 2015 estimate of 524.4 tpd and 2025 estimate of 249.4 tpd.

⁵ 2020 derived from interpolation of 2015 estimate of 11.8 tpd and 2025 estimate of 5.2 tpd.

⁶ 2022 derived from interpolation of 2015 estimate of 31.9 tpd and 2025 estimate of 28.8 tpd.

⁷ 2022 derived from interpolation of 2015 estimate of 62.5 tpd and 2025 estimate of 28.2 tpd.

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APPENDIX A
TRANSPORTATION NETWORK ASSUMPTIONS

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Appendix A - 2040 Fiscally Constrained Regional Transportation Plan
Fiscally Constrained Roadway & Rapid Transit Capacity Improvements
Remaining Project Cost Allocations (FY 2016 - 2040)

Roadway	CDOT Road	Project Location (Limits)	Improvement Type	Length (Miles)	Air Quality Network Staging	Remaining Project Cost (FY '15 \$millions)	County
A. Regional Roadway System Projects							
1. Regionally Funded with DRCOG-Controlled Funds							
6th Pkwy.		SH-30/Liverpool St. to E-470	New 2 Lane Road	1.3	2015-2024	\$19.9	Arapahoe
56th Ave.		Havana St. to Pena Blvd.	Widen from 2 to 6 Lanes	4.3	2015-2024	\$45.0	Denver
88th Ave.		I-76 NB Ramps to SH-2	Widen from 2 to 4 Lanes	1.7	2015-2024	\$21.5	Adams
104th Ave.	SH-44	Grandview Ponds to McKay Rd.	Widen from 2 to 4 Lanes	0.7	2015-2024	\$8.1	Adams
120th Ave.		Allison St. to Emerald St.	New 6 Lanes	0.4	2015-2024	\$0.0 ⁽¹⁾	Broomfield
Arapahoe Rd.	SH-88	Havana St. (or Jordan Rd.)	New Grade Separation		2025-2034	\$16.0	Arapahoe
County Line Rd.		Phillips St. to University Blvd.	Widen from 2 to 4 Lanes	1.2	2015-2024	\$9.5	Douglas
Hampden Ave./ S. Havana St.	SH-30	Florence St. to s/o Yale Ave.	Widen from 5 to 6 Lanes	1.4	2025-2034	\$14.0	Denver
I-25	I-25	Lincoln Ave.	Interchange Capacity		2015-2024	\$49.4	Douglas
I-25	I-25	Broadway	Interchange Capacity		2015-2024	\$50.0	Denver
I-25	I-25	Ridgegate Pkwy. to County Line Rd. S. Ramps	Widen from 6 to 8 Lanes	2.7	2015-2024	\$0.0 ⁽¹⁾	Douglas
I-70	I-70	Brighton Blvd. to I-270	Add 4 New Managed Lanes	3.8	2015-2024	\$1,175.7 ⁽²⁾	Denver
Kipling St.	SH-391	Colfax Ave. to I-70	Widen from 4 to 6 Lanes	3.0	2025-2034	\$18.0	Jefferson
Martin Luther King Jr. Blvd.		Havana St./Iola St. to Peoria St.	Widen 2 to 4 Lanes; New 4 Lane Road	1.0	2015-2024	\$15.0	Denver
Parker Rd.	SH-83	Quincy Ave. to Hampden Ave.	Widen from 6 to 8 Lanes	1.0	2025-2034	\$18.5	Arapahoe
Pena Blvd.		I-70 to E-470	Widen from 4 to 8 Lanes	6.4	2015-2024	\$55.0	Denver
Quebec St.	SH-35	35th Ave. to Sand Creek Dr. S.	Widen from 4 to 6 Lanes	1.2	2015-2024	\$11.0	Denver
Ridgegate Pkwy.		Havana St. to Lone Tree E. City Limit	Widen from 2 to 4 Lanes	1.8	2015-2024	\$8.0	Douglas
SH-7	SH-7	164th Ave. to Dahlia St.	Widen from 2 to 4 Lanes	2.2	2025-2034	\$32.7	Adams
Sheridan Blvd.	SH-95	I-76 to US-36	Widen from 4 to 6 Lanes	4.5	2015-2024	\$23.0	Adams/Jefferson
US-6	US-6	Federal Blvd. to Bryant St.	Interchange Capacity		2015-2024	\$0.0 ⁽¹⁾	Denver
US-36	US-36	I-25 Express Lanes to Table Mesa Dr.	Add HOT Lanes	17.2	2015-2024	\$0.0 ⁽¹⁾	Regional
US-36	US-36	Sheridan Blvd.	Interchange Capacity		2015-2024	\$0.0 ⁽¹⁾	Jefferson
US-85	US-85	Blakeland Dr. to County Line Rd.	Widen from 4 to 6 Lanes	0.5	2025-2034	\$26.0	Douglas
US-85	US-85	Highlands Ranch Pkwy. to Blakeland Dr.	Widen from 4 to 6 Lanes	1.6	2015-2024	\$24.1	Douglas
Wadsworth Blvd.	SH-121	36th Ave. to 46th Ave.	Widen from 4 to 6 Lanes	0.9	2025-2034	\$23.5	Jefferson
Wadsworth Pkwy.	SH-121	92nd Ave. to SH-128	Widen from 4 to 6 Lanes	3.7	2025-2034	\$51.4	Jefferson
Subtotal:						\$1,715.3	

Notes

(1) Project funds have been fully obligated prior to FY '15; project is under construction.

(2) Includes DRCOG contribution of \$50 million. CDOT-derived funds make up \$1,125.7 billion.

2. Regionally Funded with CDOT-Controlled Funds							
C-470	C-470	Wadsworth Blvd. to I-25	Add Toll Managed Lanes			\$220.0	Douglas/Jefferson
		EB: Platte Canyon Rd. to I-25	Add 1 New Toll Managed Lane	10.8	2015-2024		Douglas/Jefferson
		WB: I-25 to Colorado Blvd.	Add 2 New Toll Managed Lanes	4.1	2015-2024		Douglas
		WB: Colorado Blvd. to Wadsworth Blvd.	Add 1 New Toll Managed Lane	8.2	2015-2024		Douglas/Jefferson
Federal Blvd.	SH-88	6th Ave. to Howard Pl.	Widen from 5 to 6 Lanes	0.8	2015-2024	\$23.4	Denver
I-25	I-25	Arapahoe Rd.	Interchange Capacity		2015-2024	\$50.4	Arapahoe
I-25	I-25	Santa Fe Dr. (US-85) to Alameda Ave.	Interchange Capacity		2015-2024	\$27.0	Denver
I-25	I-25	Alameda Ave. to Walnut St. (Bronco Arch)	Add 1 New Lane in each direction	2.6	2025-2034	\$30.0	Denver
I-25	I-25	US-36 to Thornton Pkwy.	Add 1 New SB Lane	2.8	2015-2024	\$30.0	Adams
I-25	I-25	US-36 to 120th Ave.	Add 1 Toll/Managed Lane each direction	5.9	2015-2024	\$68.5	Adams
I-25	I-25	120th Ave. to SH-7	Add 1 Toll/Managed Lane each direction	6.0	2015-2024	\$55.0	Adams/Broomfield
I-25	I-25	SH-66 to WCR 38 (DRCOG Boundary)	Add 1 Toll/Managed Lane each direction	4.1	2035-2040	\$92.0	Weld
I-225	I-225	I-25 to Yosemite St.	Interchange Capacity		2025-2034	\$43.0	Denver
I-70	I-70	Empire Junction (US-40) to Twin Tunnels	Add/Convert 1 new EB Peak Period Managed Lane	9.6	2015-2024	\$24.0	Clear Creek
I-70	I-70	Twin Tunnels to Empire Junction (US-40)	Add 1 WB Peak Period Managed Lane	9.6	2025-2034	\$50.0	Clear Creek
I-70	I-70	Vicinity of US-6 and Floyd Hill	TBD		2015-2024	\$100.0	Clear Creek

Appendix A - 2040 Fiscally Constrained Regional Transportation Plan
Fiscally Constrained Roadway & Rapid Transit Capacity Improvements
Remaining Project Cost Allocations (FY 2016 - 2040)

Roadway	CDOT Road	Project Location (Limits)	Improvement Type	Length (Miles)	Air Quality Network Staging	Remaining Project Cost (FY '15 \$millions)	County
2. Regionally Funded with CDOT-Controlled Funds (cont'd.)							
I-270	I-270	I-25 to I-70	Widen from 4 to 6 Lanes	6.3	2035-2040	\$160.0	Adams
I-270	I-270	Vasquez Blvd. (US 6/85)	Interchange Capacity		2015-2024	\$60.0	Adams
SH-2	SH-2	72nd Ave. to I-76	Widen from 2 to 4 Lanes	7.5	2015-2024	\$13.6	Adams
SH-66	SH-66	Hover St. to Main St. (US-287)	Widen from 2 to 4 Lanes	1.5	2035-2040	\$19.0	Boulder
SH-119	SH-119	SH-52	New Interchange		2025-2034	\$30.0	Boulder
US-6	US-6	19th St.	New Interchange		2015-2024	\$20.0	Jefferson
US-6	US-6	Wadsworth Blvd.	Interchange Capacity		2025-2034	\$60.0	Jefferson
US-85	US-85	Meadows Pkwy. to Louviers Ave.	Widen from 2 to 4 Lanes	5.7		\$59.0	Douglas
		<i>Meadows Pkwy. to Castlegate</i>			<i>2015-2024</i>		
		<i>Castlegate to Daniels Park Rd.</i>			<i>2025-2034</i>		
		<i>Daniels Park Rd. to SH-67 (Sedalia)</i>			<i>2015-2024</i>		
		<i>MP 191.75 to Louviers Ave.</i>			<i>2025-2034</i>		
US-285	US-285	Pine Junction to Richmond Hill					
		<i>Pine Valley Rd. (CR 126)/Mt Evans Blvd.</i>	<i>New Interchange</i>		<i>2015-2024</i>	\$14.0	Jefferson
		<i>Kings Valley Dr.</i>	<i>New Interchange</i>		<i>2015-2024</i>	\$11.0	Jefferson
		<i>Kings Valley Dr. to Richmond Hill Rd.</i>	<i>Widen 3 to 4 Lanes (Add 1 SB Lane)</i>	0.9	<i>2015-2024</i>	\$10.0	Jefferson
		<i>Shaffers Crossing to Kings Valley Dr.</i>	<i>Widen 3 to 4 Lanes (Add 1 SB Lane)</i>	1.4	<i>2015-2024</i>	\$12.0	Jefferson
		<i>Parker Ave.</i>	<i>New Interchange</i>		<i>2015-2024</i>	\$9.0	Jefferson
Subtotal:						\$1,290.9	
3. 100% Locally Derived Funding							
6th Ave.		Airport Blvd. to Tower Rd.	Widen from 2 to 6 Lanes	1.0	2015-2024	\$10.2	Arapahoe
6th Ave.	SH-30	Tower Rd. to 6th Pkwy.	Widen from 2 to 6 Lanes	1.6	2015-2024	\$14.1	Arapahoe
6th Pkwy.		SH-30 to E-470	Widen from 2 to 6 Lanes	1.3	2025-2034	\$34.9	Arapahoe
6th Pkwy.		E-470 to Gun Club Rd.	Widen from 2 to 6 Lanes	0.3	2015-2024	\$4.9	Arapahoe
6th Ave.		6th Pkwy. to Harvest Mile Rd.	Widen from 2 to 6 Lanes	0.4	2015-2024	\$13.2	Arapahoe
17th Ave.		Alpine St. to Ute Creek Dr.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$2.3	Boulder
35th Ave.		Brighton Blvd. to Walnut St.	Widen from 2 to 4 Lanes	0.3	2025-2034	\$2.5	Denver
48th Ave.		Imboden Rd. to Quail Run Rd.	Widen from 2 to 6 Lanes	1.0	2025-2034	\$9.7	Adams
48th Ave.		Picadilly Rd. to Powhaton Rd.	New 6 Lanes	3.0	2015-2024	\$40.7	Adams
48th Ave.		Powhaton Rd. to Monaghan Rd.	New 6 Lanes	1.0	2025-2034	\$13.6	Adams
56th Ave.		E-470 to Imboden Rd.	Widen from 2 to 6 Lanes	7.0	2015-2024	\$67.9	Adams
56th Ave.		Picadilly Rd. to E-470	Widen from 2 to 6 Lanes	1.0	2015-2024	\$9.7	Adams
56th Ave.		Dunkirk St. to Himalaya St.	Widen from 4 to 6 Lanes	0.5	2015-2024	\$11.5	Denver
56th Ave.		Himalaya St. to Picadilly Rd.	Widen from 2 to 6 Lanes	1.0	2015-2024	\$5.8	Denver
56th Ave.		Pena Blvd. to Tower Rd.	Widen from 4 to 6 Lanes	0.7	2015-2024	\$17.3	Denver
58th Ave.		Washington St. to York St.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$10.4	Adams
64th Ave.		Denver/Aurora City Limit to Himalaya St.	Widen from 2 to 6 Lanes	0.5	2015-2024	\$6.5	Adams
64th Ave.		Harvest Mile Rd. to Powhaton Rd.	New 2 Lanes	1.0	2015-2024	\$6.5	Adams
64th Ave.		Harvest Mile Rd. to Powhaton Rd.	Widen from 2 to 4 Lanes	1.0	2025-2034	\$10.9	Adams
64th Ave.		Himalaya Rd. to Harvest Mile Rd.	Widen from 2 to 4 Lanes	3.0	2015-2024	\$12.3	Adams
64th Ave.		Powhaton Rd. to Monaghan Rd.	New 4 Lanes	1.0	2015-2024	\$6.7	Adams
64th Ave.		Tower Rd. to Denver/Aurora City Limits	Widen from 2 to 4 Lanes	0.5	2015-2024	\$0.7	Denver
64th Ave.		Terry St. to Kendrick Dr.	Widen from 2 to 4 Lanes	1.2	2015-2024	\$6.4	Jefferson
96th Ave.		SH-2 to Tower Road	Widen from 2 to 4 Lanes	5.0	2025-2034	\$46.7	Adams
96th Ave.		Tower Rd. to Picadilly Rd.	Widen from 2 to 6 Lanes	2.0	2025-2034	\$14.7	Adams
96th St.		96th St. at Northwest Pkwy. to SH-128	Add Toll Lanes	2.3	2015-2024	\$39.4	Broomfield
104th Ave.		Marion St to Colorado Blvd	Widen from 4 to 6 Lanes	1.6	2025-2034	\$6.3	Adams
104th Ave.		US-85 to SH-2	Widen from 2 to 4 Lanes	1.8	2015-2024	\$41.2	Adams
104th Ave.	SH-44	McKay Road to US-85	Widen from 2 to 4 Lanes	1.9	2025-2034	\$40.6	Adams
120th Ave.		Sable Blvd. to E-470	Widen from 2 to 6 Lanes	2.0	2025-2034	\$29.7	Adams
120th Ave.		E-470 to Picadilly Rd.	Widen from 2 to 6 Lanes	2.6	2025-2034	\$15.5	Adams
144th Ave.		Washington St. to York St.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$12.8	Adams
144th Ave.		York St. to Colorado Blvd.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$10.4	Adams
144th Ave.		US-287 to Zuni St.	Widen from 2 to 4 Lanes	3.5	2015-2024	\$21.2	Broomfield
152nd Ave.		Washington St. to York St.	Widen from 2 to 4 Lanes	1.2	2025-2034	\$11.1	Adams

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Fiscally Constrained Roadway & Rapid Transit Capacity Improvements
Remaining Project Cost Allocations (FY 2016 - 2040)

Roadway	CDOT Road	Project Location (Limits)	Improvement Type	Length (Miles)	Air Quality Network Staging	Remaining Project Cost (FY '15 \$millions)	County
3. 100% Locally Derived Funding (cont'd.)							
160th Ave.		Lowell Blvd. to Sheridan Pkwy.	New 2 Lanes	1.0	2015-2024	\$3.8	Broomfield
Alameda Ave.		McIntyre St. to Rooney Rd.	Widen from 2 to 6 Lanes	0.3	2015-2024	\$2.6	Jefferson
Alameda Ave.		Bear Creek Blvd. to McIntyre St.	Widen from 2 to 4 Lanes	1.3	2015-2024	\$7.6	Jefferson
Arapahoe Rd.		Himalaya Way to Liverpool St.	Widen from 4 to 6 Lanes	0.5	2025-2034	\$6.2	Arapahoe
Arapahoe Rd.		Waco St. to Himalaya St.	Widen from 2 to 6 Lanes	1.3	2015-2024	\$20.4	Arapahoe
Bayou Gulch Rd. /Chambers Rd.		Parker Road to Parker S. Town Limit	Widen from 0/2 to 4 Lanes	2.4	2025-2034	\$18.4	Douglas
Broadway		Arizona Ave. to Mississippi Ave.	Widen from 4 to 6 Lanes	0.1	2015-2024	\$2.5	Denver
Broadway		Kentucky Ave. to Exposition Ave.	Widen from 4 to 6 Lanes	0.3	2015-2024	\$4.8	Denver
Broadway		Mississippi Ave. to Kentucky Ave.	Widen from 6 to 8 Lanes	0.3	2015-2024	\$5.0	Denver
Broncos Pkwy.		Jordan Rd. to Parker Rd.	Widen from 4 to 6 Lanes	0.8	2015-2024	\$6.9	Arapahoe
Broncos Pkwy.		Havana St. to Peoria St.	Widen from 4 to 6 Lanes	1.0	2015-2024	\$8.1	Arapahoe
Buckley Rd.		118th Ave. to Cameron Dr.	Widen from 2 to 6 Lanes	1.3	2015-2024	\$13.9	Adams
Buckley Rd.		136th Ave. to Bromley Ln.	Widen from 2 to 4 Lanes	2.0	2015-2024	\$7.8	Adams
C-470	C-470	S. Kipling Pkwy. to I-25	Add New Toll/Managed Lanes				
		<i>WB: Wadsworth Blvd. to S. Kipling Pkwy.</i>	<i>Add 1 Toll/Managed Lane</i>	<i>1.4</i>	<i>2025-2034</i>	<i>\$45.0</i>	<i>Jefferson</i>
		<i>EB: S. Kipling Pkwy. to Platte Canyon Rd.</i>	<i>Add 1 Toll/Managed Lane</i>	<i>3.0</i>	<i>2025-2034</i>		<i>Jefferson</i>
		<i>WB: Colorado Blvd. to Lucent Blvd.</i>	<i>Add 1 Toll/Managed Lane</i>	<i>3.7</i>	<i>2025-2034</i>	<i>\$120.0</i>	<i>Douglas</i>
		<i>EB: Broadway to I-25</i>	<i>Add 1 Toll/Managed Lane</i>	<i>6.6</i>	<i>2025-2034</i>		<i>Douglas</i>
Canyons Pkwy.		Crowfoot Valley Rd. to Hess Rd.	New 4 Lanes	4.1	2015-2024	\$19.1	Douglas
Central Park Blvd.		47th Ave. (Northfield Blvd.) to 56th Ave.	New 4 Lanes	0.9	2015-2024	\$4.3	Denver
Chambers Rd.		Crowfoot Valley Road to Parker S. Town Limit	New 2 Lanes	0.7	2025-2034	\$3.1	Douglas
Chambers Rd.		Crowfoot Valley Road to Parker S. Town Limit	Widen from 2 to 4 Lanes	0.7	2015-2024	\$3.1	Douglas
Chambers Rd.		Crowfoot Valley Rd. to Hess Rd.	New 4 Lanes	2.3	2015-2024	\$15.4	Douglas
Chambers Rd.		Hess Rd. to Mainstreet	Widen from 2 to 4 Lanes	1.9	2015-2024	\$12.6	Douglas
Chambers Rd.		Mainstreet to Lincoln Ave.	Widen from 2 to 4 Lanes	1.4	2015-2024	\$4.4	Douglas
Colorado Blvd.		144th Ave. to 168th Ave.	Widen from 0/2 to 4 Lanes	3.7	2025-2034	\$23.5	Adams
Crowfoot Valley Rd.		Stroh Rd. to Chambers Rd.	Widen from 2 to 4 Lanes	1.4	2015-2024	\$6.4	Douglas
Crowfoot Valley Rd.		Macanta Rd. to Chambers Rd.	Widen from 2 to 4 Lanes	3.6	2025-2034	\$22.9	Douglas
Crowfoot Valley Rd.		Founders Pkwy. to Macanta Rd.	Widen from 2 to 4 Lanes	1.1	2025-2034	\$5.1	Douglas
E. Bromley Ln.		Hwy 85 to Sable Blvd.	Widen from 4 to 6 Lanes	0.5	2015-2024	\$1.3	Adams
E. Bromley Ln.		Tower Rd. to I-76	Widen from 4 to 6 Lanes	1.1	2015-2024	\$1.9	Adams
E-470		48th Ave.	Add New Interchange		2015-2024	\$26.9	Adams
E-470		88th Ave.	Add New Interchange		2025-2034	\$17.6	Adams
E-470		I-25 North to I-76	Widen from 4 to 6 Lanes	11.0	2025-2034	\$76.5	Adams
E-470		Potomac	Add New Interchange		2015-2024	\$8.0	Adams
E-470		Quebec	Add New Interchange		2015-2024	\$24.8	Adams
E-470		112th Ave.	Add New Interchange		2025-2034	\$17.6	Adams
E-470		I-70 to Pena Blvd.	Widen from 4 to 6 Lanes	7.4	2025-2034	\$29.3	Adams/Denver
E-470		Pena Blvd. to I-76	Widen from 4 to 6 Lanes	7.6	2025-2034	\$51.5	Adams/Denver
E-470		I-25 to Parker Rd.	Widen from 6 to 8 Lanes	5.5	2025-2034	\$32.0	Arapahoe
E-470		Parker Rd. to I-70	Widen from 4 to 6 Lanes	15.2	2025-2034	\$67.3	Arapahoe/Douglas
East County Line Rd.		9th Ave. to SH-66	Widen from 2 to 4 Lanes	2.0	2025-2034	\$9.8	Boulder
Erie Pkwy.		US-287 to 119th St.	Widen from 2 to 4 Lanes	1.5	2015-2024	\$14.6	Boulder
Green Valley Ranch Blvd.		Chambers Rd. to Telluride St.	Widen from 4 to 6 Lanes	1.5	2015-2024	\$9.9	Denver
Green Valley Ranch Blvd.		Chambers Rd. to Pena Blvd.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$2.4	Denver
Green Valley Ranch Blvd.		Telluride St. to Tower Rd.	Widen from 4 to 6 Lanes	0.5	2015-2024	\$1.7	Denver
Gun Club Rd.		1.5 Miles s/of Quincy Ave. to Quincy Ave.	Widen from 2 to 6 Lanes	1.6	2015-2024	\$26.7	Arapahoe
Gun Club Rd.	SH-30	Yale Ave. to Mississippi Ave.	Widen from 2/4 to 6 Lanes	2.1	2025-2034	\$10.9	Arapahoe
Hampden Ave.		Picadilly Rd. to Gun Club Rd.	Widen from 2 to 4 Lanes	1.1	2015-2024	\$12.4	Arapahoe
Harvest Mile Rd.		56th Ave. to 64th Ave.	New 3 Lanes	1.0	2015-2024	\$6.5	Adams
Harvest Mile Rd.		56th Ave. to 64th Ave.	Widen from 3 to 6 Lanes	1.0	2025-2034	\$7.8	Adams
Harvest Mile Rd.		I-70 to 56th Ave.	New 6 Lanes	4.1	2015-2024	\$54.3	Adams
Harvest Mile Rd.		Jewell Ave. to Mississippi Ave.	Widen from 2 to 6 Lanes	1.0	2025-2034	\$13.3	Arapahoe
Harvest Rd.		6th Ave. to I-70	New 6 Lanes	1.1	2015-2024	\$13.3	Adams
Harvest Rd.		Alameda Ave. to 6th Ave.	Widen from 3 to 6 Lanes	1.0	2015-2024	\$6.7	Arapahoe

Appendix A - 2040 Fiscally Constrained Regional Transportation Plan
Fiscally Constrained Roadway & Rapid Transit Capacity Improvements
Remaining Project Cost Allocations (FY 2016 - 2040)

Roadway	CDOT Road	Project Location (Limits)	Improvement Type	Length (Miles)	Air Quality Network Staging	Remaining Project Cost (FY '15 \$millions)	County
3. 100% Locally Derived Funding (cont'd.)							
Harvest Rd.		Mississippi Ave. to Alameda Ave.	New 6 Lanes	1.0	2015-2024	\$13.3	Arapahoe
Hess Rd.		I-25 to Chambers Rd.	Widen from 2 to 4 Lanes	5.1	2025-2034	\$44.5	Douglas
Hess Rd.		Motsenbocker Rd. to Nate Dr.	Widen from 2 to 4 Lanes	0.5	2015-2024	\$3.5	Douglas
Hilltop Rd.		Canterberry Pkwy. to Singing Hills Rd.	Widen from 2 to 4 Lanes	2.7	2025-2034	\$17.8	Douglas
Huron St.		150th Ave. to 160th Ave.	Widen from 2 to 4 Lanes	1.3	2015-2024	\$8.6	Broomfield
Huron St.		160th Ave. to SH-7	Widen from 2 to 4 Lanes	1.2	2015-2024	\$5.1	Broomfield
I-25	I-25	Castlegate Dr.	Add New Interchange		2015-2024	\$15.3	Douglas
I-25	I-25	Crystal Valley Pkwy.	Add New Interchange		2025-2034	\$44.5	Douglas
I-70	I-70	E-470	Interchange Capacity		2025-2034	\$100.0	Adams/Arapahoe
I-70	I-70	Harvest Mile Rd.	Add New Interchange		2015-2024	\$39.6	Adams/Arapahoe
I-70	I-70	32nd Ave.	Interchange Capacity		2015-2024	\$22.4	Jefferson
I-70	I-70	Picadilly Rd.	Add New Interchange		2015-2024	\$27.5	Adams
I-76	I-76	Bridge St.	Add New Interchange		2015-2024	\$25.4	Adams
Imboden Rd.		48th Ave. to 56th Ave.	Widen from 2 to 6 Lanes	1.0	2025-2034	\$10.3	Adams
Jefferson Pkwy.		Initial Phase: SH-93 to SH-128	New 4 Lane Toll Road; 3 Partial Interchanges	10.2	2015-2024	\$259.1	Jefferson
		<i>Candelas Pkwy.</i>	<i>New Partial Interchange</i>		<i>2015-2024</i>		
		<i>Indiana St. s/o SH-128</i>	<i>New Partial Interchange</i>		<i>2015-2024</i>		
		<i>SH-72</i>	<i>New Partial Interchange</i>		<i>2015-2024</i>		
Jewell Ave.		E-470 to Gun Club Rd.	Widen from 2 to 6 Lanes	0.5	2015-2024	\$4.9	Arapahoe
Jewell Ave.		Gun Club Rd. to Harvest Rd.	Widen from 2 to 6 Lanes	1.0	2015-2024	\$10.0	Arapahoe
Jewell Ave.		Himalaya Rd. to E-470	Widen from 3 to 6 Lanes	1.4	2015-2024	\$13.2	Arapahoe
Jordan Rd.		Bradbury Pkwy. to Hess Rd.	Widen from 2 to 4 Lanes	0.6	2015-2024	\$3.0	Douglas
Lincoln Ave.		1st St. to Keystone Blvd.	Widen from 4 to 6 Lanes	1.8	2025-2034	\$8.3	Douglas
Lincoln Ave.		Keystone Blvd. to Parker Rd.	Widen from 4 to 6 Lanes	1.6	2015-2024	\$8.0	Douglas
Lincoln Ave.		Peoria St. to 1st Ave.	Widen from 4 to 6 Lanes	0.7	2015-2024	\$3.2	Douglas
Mainstreet		Canterberry Pkwy. to Tomahawk Rd.	Widen from 2 to 4 Lanes	1.4	2025-2034	\$7.6	Douglas
Mainstreet		Lone Tree E. City Limit to Chambers Rd.	Widen from 2 to 4 Lanes	0.9	2025-2034	\$7.6	Douglas
Monaghan Rd.		Quincy Ave. to Yale Ave.	New 6 Lanes	2.0	2025-2034	\$22.9	Arapahoe
Nelson Rd.		75th St. to Affolter Dr.	Widen from 2 to 4 Lanes	2.3	2015-2024	\$5.2	Boulder
Pace St.		5th Ave. to Ute Rd.	Widen from 2 to 4 Lanes	2.5	2015-2024	\$3.8	Boulder
Pecos St.		52nd Ave. to I-76	Widen from 2 to 4 Lanes	1.3	2015-2024	\$8.7	Adams
Pena Blvd.		Jackson Gap St. West Ramps to DIA Terminal	Widen from 6 to 8 Lanes	1.7	2015-2024	\$10.2	Denver
Peoria St.		E-470 to .75 miles s/o Lincoln Ave.	Widen from 2 to 4 Lanes	1.9	2015-2024	\$4.4	Douglas
Peoria St.		.75 miles s/o Lincoln Ave. to Mainstreet	Widen from 2 to 4 Lanes	0.5	2025-2034	\$4.4	Douglas
Picadilly Rd.		48th Ave. to 56th Ave.	Widen from 2 to 6 Lanes	1.2	2015-2024	\$13.6	Adams
Picadilly Rd.		56th Ave. to 70th Ave./Aurora City Limits	New 6 Lanes	1.7	2015-2024	\$20.4	Adams
Picadilly Rd.		82nd Ave. to 96th Ave.	New 6 Lanes	1.8	2025-2034	\$21.6	Adams
Picadilly Rd.		Colfax Ave. to I-70	New 6 Lanes	0.3	2015-2024	\$12.9	Adams
Picadilly Rd.		I-70 to Smith Rd.	Widen from 2 to 6 Lanes	0.5	2015-2024	\$5.3	Adams
Picadilly Rd.		Smith Rd. to 48th Ave.	Widen from 2 to 6 Lanes	2.2	2015-2024	\$22.5	Adams
Picadilly Rd.		96th Ave. to 120th Ave.	New 6 Lanes	3.0	2025-2034	\$49.0	Adams
Picadilly Rd.		6th Ave. to Colfax Ave.	Widen from 2 to 6 Lanes	1.6	2015-2024	\$10.0	Arapahoe
Picadilly Rd.		Jewell Ave. to 6th Pkwy.	New 4 Lanes	2.7	2015-2024	\$18.1	Arapahoe
Picadilly Rd.		70th Ave. to 82nd Ave.	New 6 Lanes	1.5	2015-2024	\$11.4	Denver
Plum Creek Pkwy.		Gilbert St. to Ridge Rd.	Widen from 2 to 4 Lanes	1.5	2015-2024	\$5.1	Douglas
Powhaton Rd.		Smoky Hill Rd. to County Line Rd.	Widen from 2 to 6 Lanes	1.0	2025-2034	\$3.5	Arapahoe
Quail Run Rd.		I-70 to 48th Ave.	New 6 Lanes	3.0	2025-2034	\$36.4	Adams
Quebec St.		120th Ave. to 128th Ave.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$8.4	Adams
Quebec St.		132nd Ave. to 160th Ave.	Widen from 2 to 4 Lanes	3.5	2015-2024	\$21.0	Adams
Quincy Ave.		Plains Pkwy. to Gun Club Rd.	Widen from 2 to 6 Lanes	0.6	2015-2024	\$13.3	Arapahoe
Quincy Ave.		Hayesmount Rd. to Watkins Rd.	Widen from 2 to 6 Lanes	2.0	2025-2034	\$16.0	Arapahoe
Quincy Ave.		Monaghan Rd. to Hayesmount Rd.	Widen from 2 to 6 Lanes	1.1	2025-2034	\$18.9	Arapahoe
Quincy Ave.		C-470 to Simms St.	Widen from 2 to 4 Lanes	1.9	2025-2034	\$16.0	Jefferson
Quincy Ave.		Kipling St. to Carr St.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$10.2	Jefferson
Quincy Ave.		Simms St. to Kipling Pkwy.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$12.0	Jefferson

Appendix A - 2040 Fiscally Constrained Regional Transportation Plan
Fiscally Constrained Roadway & Rapid Transit Capacity Improvements
Remaining Project Cost Allocations (FY 2016 - 2040)

Roadway	CDOT Road	Project Location (Limits)	Improvement Type	Length (Miles)	Air Quality Network Staging	Remaining Project Cost (FY '15 \$millions)	County
3. 100% Locally Derived Funding (cont'd.)							
Quincy Ave.		Irving St. to Federal Blvd.	New 2 Lanes	0.3	2015-2024	\$3.8	Arapahoe
Rampart Range Rd.		Waterton Rd. to Titan Rd.	Widen from 2 to 4 Lanes	1.5	2025-2034	\$10.2	Douglas
Ridge Rd.		Plum Creek Pkwy. to SH-86	Widen from 2 to 4 Lanes	1.1	2015-2024	\$3.8	Douglas
S. Boulder Rd./160th Ave.		120th St. to Boulder/Broomfield County Line	New 2 Lanes	1.2	2025-2034	\$10.2	Boulder
SH-7	SH-7	Riverdale Rd. to US-85	Widen from 2 to 4 Lanes	1.1	2025-2034	\$16.3	Adams
SH-7	SH-7	Boulder County Line to Sheridan Pkwy.	Widen from 2 to 4 Lanes	2.5	2015-2024	\$6.6	Broomfield
SH-7	SH-7	Sheridan Pkwy. to I-25	Widen from 2 to 6 Lanes	1.5	2015-2024	\$10.2	Broomfield
SH-58	SH-58	Cabela St.	Add New Interchange		2015-2024	\$19.6	Jefferson
Sheridan Blvd.		Lowell Blvd. to NW Pkwy.	Widen from 2 to 4 Lanes	1.1	2015-2024	\$7.6	Broomfield
Sheridan Pkwy.		NW Pkwy. to SH-7	Widen from 2 to 4 Lanes	1.3	2015-2024	\$5.7	Broomfield
Smoky Hill Rd.		Pheasant Run Pkwy. to Versailles Pkwy.	Widen from 4 to 6 Lanes	4.4	2025-2034	\$33.9	Arapahoe
Southwest Ring Rd.		Wolfensberger Rd. to I-25	Widen from 2 to 4 Lanes	1.4	2015-2024	\$5.1	Douglas
Stroh Rd.		Crowfoot Valley Rd. to J. Morgan Blvd.	Widen from 2 to 4 Lanes	0.5	2015-2024	\$6.4	Douglas
Stroh Rd.		Chambers Rd. to Crowfoot Valley Rd.	New 4 Lanes	1.4	2015-2024	\$10.6	Douglas
Thornton Pkwy.		Colorado Blvd. to Riverdale Rd.	Widen from 2 to 4 Lanes	0.5	2025-2034	\$14.0	Adams
Titan Rd.		Rampart Range Rd. to Santa Fe Dr.	Widen from 2 to 4 Lanes	3.0	2025-2034	\$38.1	Douglas
Tower Rd.		Colfax Ave. to Smith Rd.	Widen from 2 to 6 Lanes	1.0	2015-2024	\$8.7	Adams
Tower Rd.		Pena Blvd. to 105th Ave.	Widen from 2 to 6 Lanes	3.8	2015-2024	\$23.2	Adams
Tower Rd.		6th Ave. to Colfax Ave.	New 2 Lanes	1.0	2015-2024	\$9.5	Arapahoe
Tower Rd.		6th Ave. to Colfax Ave.	Widen from 2 to 6 Lanes	1.0	2025-2034	\$16.3	Arapahoe
Tower Rd.		38th/40th Ave. to Green Valley Ranch Blvd.	Widen from 2/4 to 6 Lanes	1.0	2015-2024	\$26.7	Denver
Tower Rd.		56th Ave. to Pena Blvd.	Widen from 4 to 6 Lanes	2.4	2015-2024	\$16.0	Denver
Tower Rd.		48th Ave. to 56th Ave.	Widen from 4 to 6 Lanes	1.0	2015-2024	\$5.3	Denver
Tower/Buckley Rd.		105th Ave. to 118th Ave.	New 4 Lanes	2.0	2015-2024	\$8.8	Adams
US-85	US-85	Titan Rd. to Highland Ranch Pkwy.	Widen from 4 to 6 Lanes	2.2	2025-2034	\$5.9	Douglas
US-85	US-85	Castlegate Dr.	Add New Interchange		2015-2024	\$31.8	Douglas
Washington St.		144th Ave. to 152nd Ave.	Widen from 2 to 4 Lanes	0.7	2015-2024	\$12.0	Adams
Washington St.		52nd Ave. to 58th Ave.	Widen from 2 to 4 Lanes	0.8	2015-2024	\$4.4	Adams
Washington St.		152nd Ave. to 160th Ave.	Widen from 2 to 4 Lanes	1.4	2015-2024	\$24.8	Adams
Washington St.		Elk Pl. to 52nd Ave.	Widen from 2 to 4 Lanes	0.6	2015-2024	\$13.3	Denver
Waterton Rd.		Dante Dr. to Campfire St.	Widen from 2 to 4 Lanes	1.0	2025-2034	\$3.8	Douglas
Watkins Rd.		Quincy Ave. to I-70	Widen from 2 to 6 Lanes	7.1	2025-2034	\$54.7	Arapahoe
Wolfensberger Rd.		Coachline Rd. to Prairie Hawk Dr.	Widen from 2 to 4 Lanes	1.0	2025-2034	\$7.5	Douglas
Yale Ave.		Monaghan Rd. to Hayesmount Rd.	Widen from 2 to 6 Lanes	1.1	2025-2034	\$17.3	Arapahoe
York St.		152nd Ave. to E-470	Widen from 2 to 4 Lanes	0.2	2025-2034	\$2.0	Adams
York St.		160th Ave. (SH-7) to 168th Ave.	Widen from 2 to 4 Lanes	1.0	2015-2024	\$7.5	Adams
York St.		E-470 to SH-7	Widen from 2 to 4 Lanes	0.7	2015-2024	\$10.7	Adams
Subtotal:						\$3,165.2	
Grand Total for Regional Roadway System Projects:						\$6,171.4	

B. Regional Transit Projects

FasTracks Components

Eagle Project						\$1,033.2	
East Rail Line		DUS to DIA	Commuter Rail	22.8	2015-2024		Adams/Denver
Gold Line		DUS to Ward Rd.	Commuter Rail	11.2	2015-2024		Multiple
Northwest Rail Phase 1		DUS to 71st/Lowell Blvd.	Commuter Rail	6.2	2015-2024		Adams/Denver
I-225 Rail Line		Parker Rd. to East Rail Line	Light Rail	10.5	2015-2024	\$476.9	Adams/Arapahoe
North Metro Commuter Rail		DUS to 124th Ave.	Commuter Rail	13.0	2015-2024	\$606.8	Adams/Denver
Southeast Rail Extension		Lincoln Ave. to Ridgeway Pkwy.	Light Rail	2.3	2015-2024	\$205.9	Douglas
US-36 Bus Rapid Transit		DUS to Table Mesa	Bus Rapid Transit	18.0	2015-2024	\$78.9	Multiple
Other FasTracks Projects						\$99.4	
Other Regional Transit							
Colfax Ave.	US-40	7th St. to Potomac St.	Bus Rapid Transit	10.5	2015-2024	\$115.0	Adams/Denver
SH-119	SH-119	Foothills Pkwy to US-287	Bus Rapid Transit	11.0	2015-2024	\$57.0	Boulder
Total of Regional Transit Projects						\$2,673.1	

Figure 3
2040 Regional Transportation Plan
Staging of Fiscally Constrained Roadway Projects

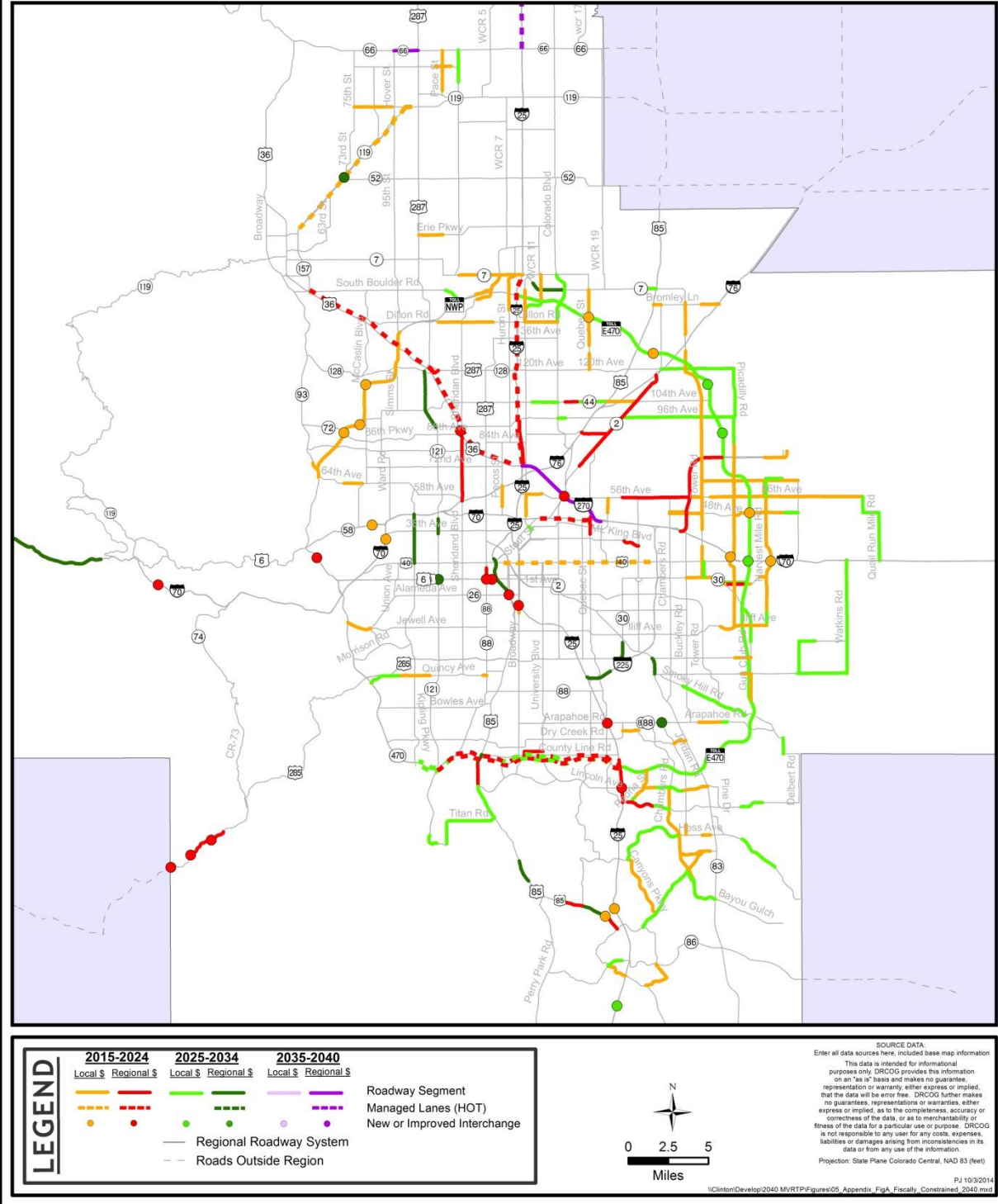
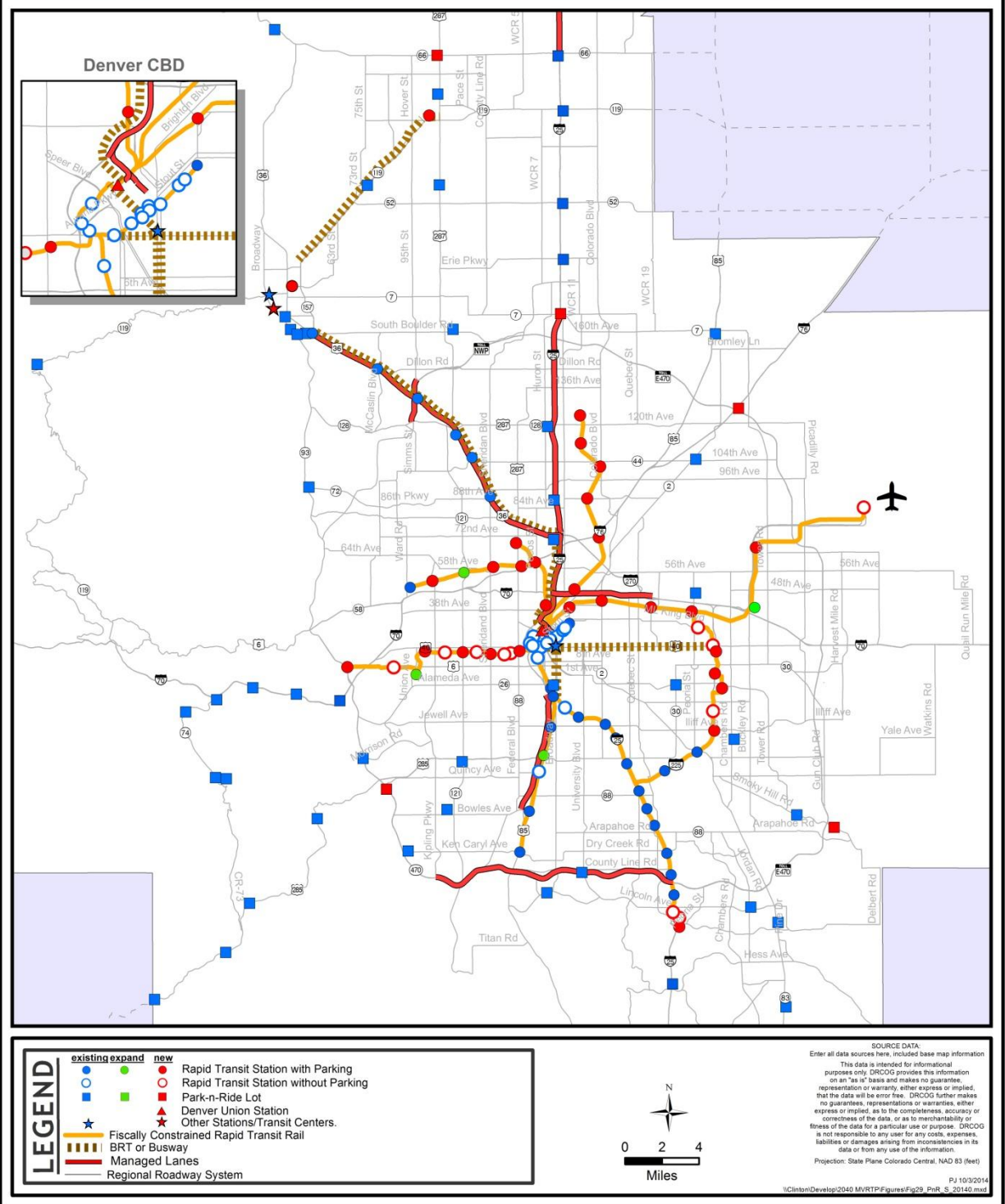


Figure 4
2040 Regional Transportation Plan
Fiscally Constrained Rapid Transit Park-n-Ride & Station Locations



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APPENDIX B

TRANSPORTATION MODEL CALIBRATION DESCRIPTION

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Introduction

In support of the conformity determination for the 2040 Regional Transportation Plan (RTP), the Denver Regional Council of Governments' (DRCOG) Regional Planning and Operations Division used the Regional UrbanSim Socio-economic Model together with *Focus*, the updated regional travel modeling system. Travel modeling uses mathematical formulations in computer software programs to show how regional development impacts road and transit usage.

The *Focus* model simulates the travel of millions of individual people in the region throughout a typical weekday. The *Focus* model sums all travel to forecast how many vehicles will be driven on major roads; how much congestion there will be; and how many people will walk, bike or use transit. To realistically simulate each person's daily travel, *Focus* and UrbanSim model the many choices each person makes, including:

- (1) where to work
- (2) where to go to school
- (3) how many automobiles are owned by the person's household
- (4) how many trips each person makes in a day, and for what reasons
- (5) which trips are chained together into home-to-home tours
- (6) the address where each trip starts from and goes to
- (7) the travel mode for each trip, with choices including walk and biking
- (8) which major streets or bus routes were chosen to reach each destination

The models take into account many characteristics of people, such as their age, gender, employment status, and income; and how the region will change demographically over time. It also takes into account characteristics of the built environment such as congestion, density, and walkability.

The *Focus* travel model was initially estimated based on detailed data from a survey called the Travel Behavior Inventory (TBI). The TBI project involved multiple surveys of travel in the Denver metropolitan area, including:

- The Household Survey – a travel diary survey that gathered complete travel information for an assigned day for approximately 5,000 households;
- The Front Range Travel Survey - a survey of vehicles entering and leaving the metropolitan area;

- The Commercial Vehicle Survey – a survey that gathered complete travel information from more than 800 commercial vehicles on an assigned day; and
- The Non-Respondent Populations Project - an effort to evaluate whether those who did not respond to the survey exhibited different travel behavior than people who did respond to the survey.

The bulk of this survey work was conducted in 1997-1998, with data “cleaning” and summary conducted through 2001.

Focus was calibrated using 2005 data sources including roadway counts, transit boardings, American Community Survey data, and Census data.

Since this original work, additional surveys of travel behavior have been conducted, including:

- RTD's 2008 Regional On-Board Transit Survey – a questionnaire handed out to light rail and bus travelers to understand how transit travel patterns have changed since the opening of the Southeast Corridor Light Rail in November 2006. The survey contains information on almost 24,000 transit trips.
- The 2010 Front Range Travel Counts Household Survey – A survey of over 12,000 households along the Colorado Front Range, including 7,000 in the DRCOG region, using a format similar to the 1997 TBI Household Survey described above.

In developing the 2040 RTP this year, the mathematical relationships within the *Focus* model were adjusted to better reflect the travel behavior recorded in these two surveys, including:

- Where people live and work within the region
- Where students attend school
- How many trips of each type different kinds of people make on a typical day
- How far people travel for various kinds of trips
- Preferences about traveling by auto, carpool, transit, biking and walking
- How different types of transit riders trade off different elements of their trip, such as the fare, in-vehicle time, access and egress times, and waiting time

The final outputs of *Focus* were also checked against traffic counts and RTD ridership data to make sure the overall regional travel patterns being forecasted were reasonable.

Demographic Forecasts

DRCOG works with a panel of economists and planners from both the private and public sectors to review current growth trends and evaluate the output of a regional forecasting model. This model relates the regional economy to national economic forecasts. The forecasts are reviewed annually with major revisions expected every five years.

Small Area Development Estimates

To provide development data at a level of detail necessary for the travel model, the regional urban activity forecasts are dis-aggregated into 2,800 transportation analysis zones (TAZs), as shown in Figure 1. The allocation to TAZs is carried out within the UrbanSim model based on the dynamics of urban land markets and the simulated decisions of land developers, and residential and commercial land customers. The UrbanSim model considers questions such as:

- What parcels of land are profitable for development, and for what uses?
- Where should a firm locate to conduct its business in accordance with zoning regulations, and with suitable access to workers, supplies, and finished product markets?
- Does a family's current house continue to meet its needs and be convenient to jobs, schools, and other activities, or should the family move to a better house?
- What size and types of house does a family need based on the number and ages of its members and its household income?
- What neighborhoods are convenient to work and offer the amenities the family values?

The UrbanSim model includes a population synthesizer that creates a descriptive database record for each household in the region (about one million records in 2010) and each person (about 2.8 million records in 2010). The effects of several regional planning policies also are taken into account in the model: open space plans affect the amount of developable land in the relevant parcels; the regional Urban Growth Boundary/Area affects expected densities, and the development totals in parcels outside that boundary. Figure 2 shows a flowchart for the process of socioeconomic forecasting in the Denver region.

Figure 1
DRCOG Travel Analysis Zones

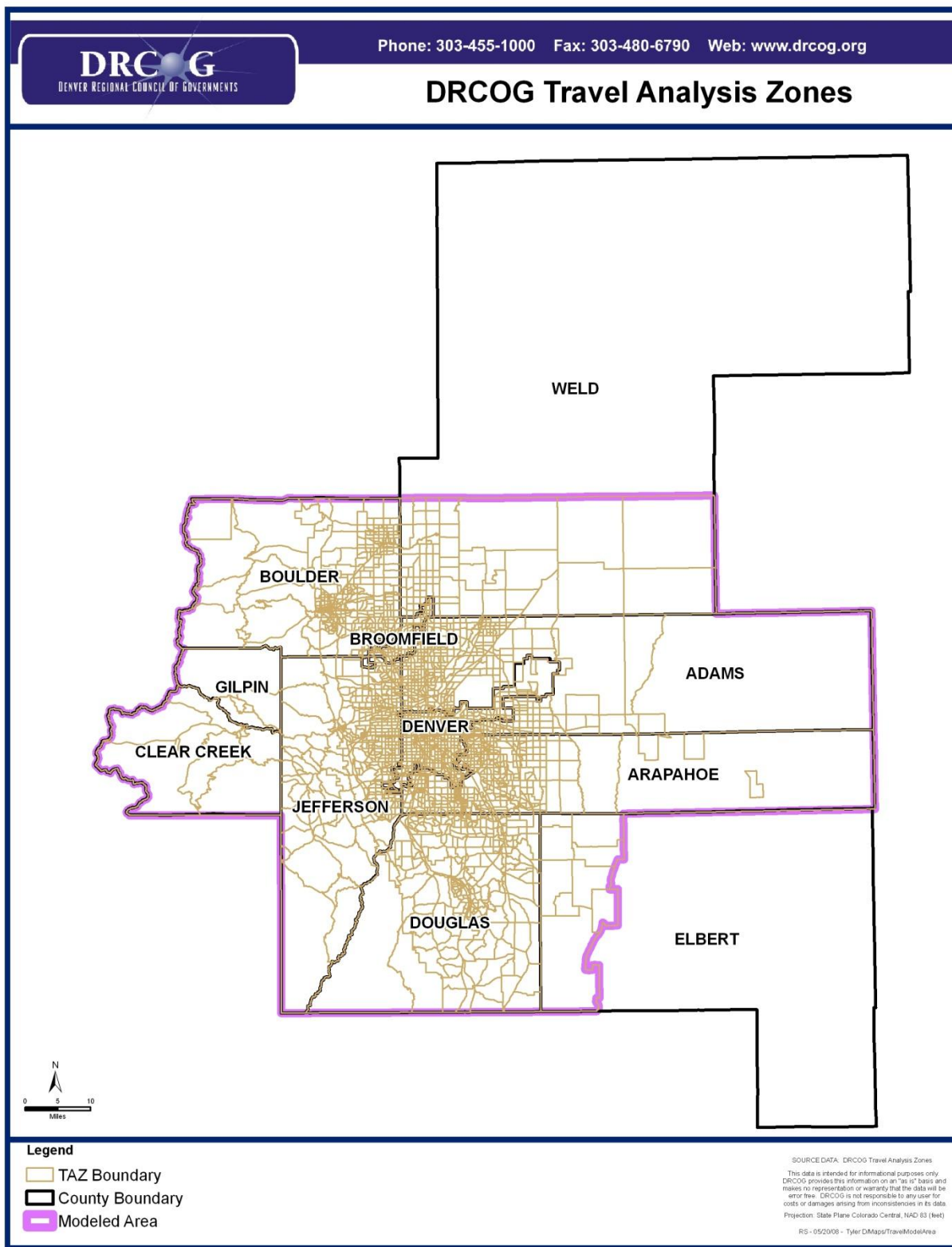


Figure 2
Socioeconomic Model Elements and Flow

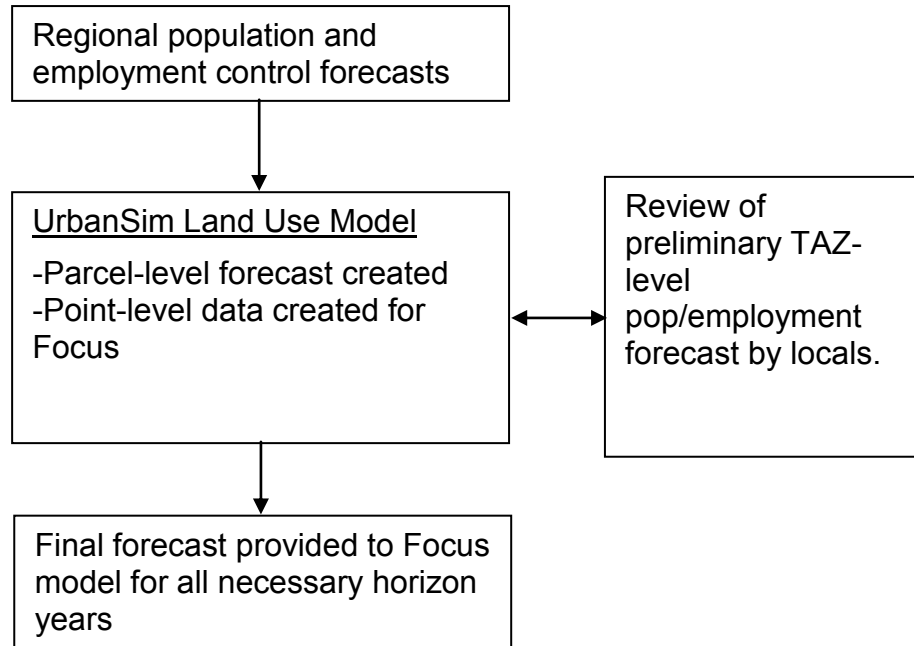
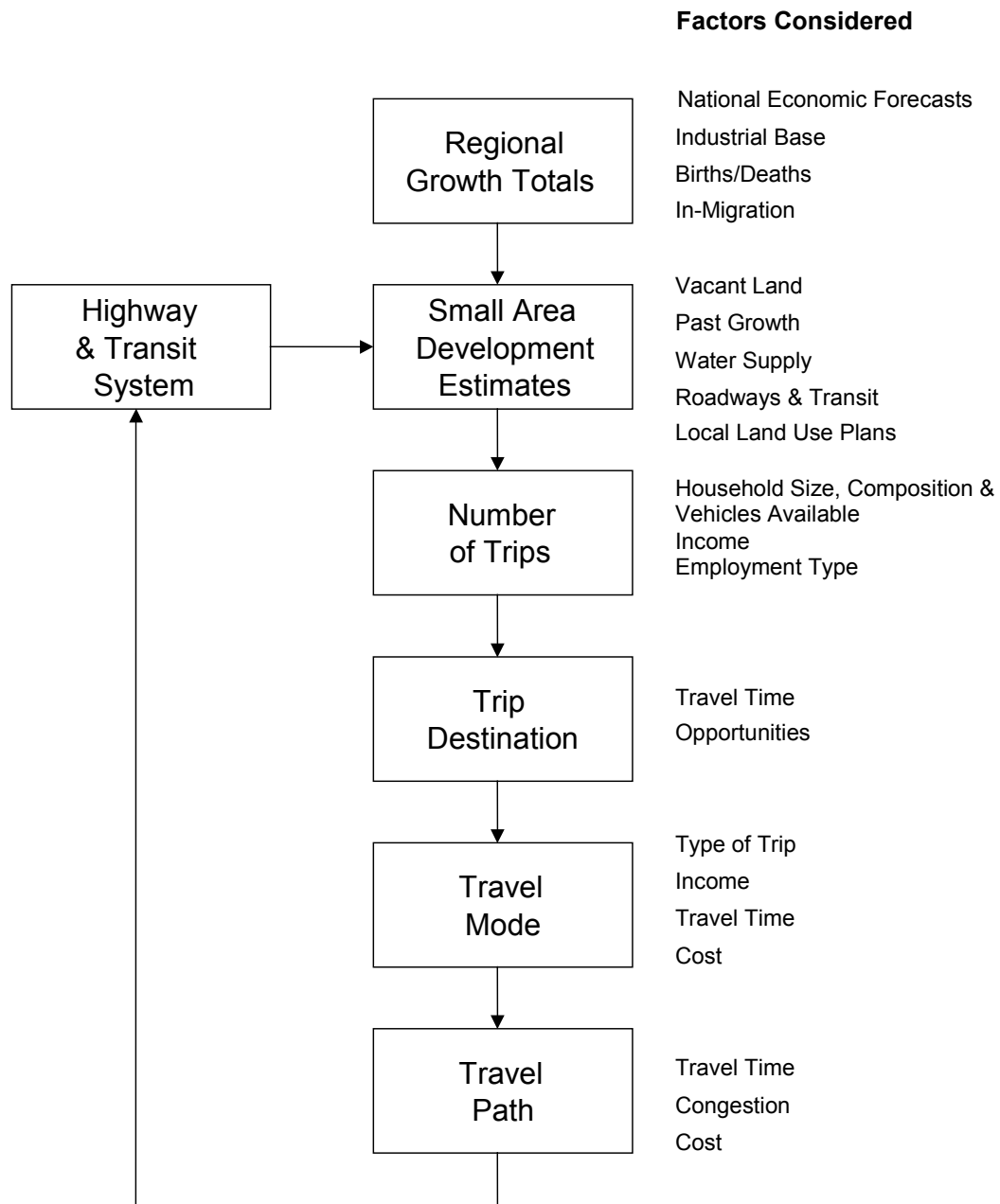


Figure 3
Travel Model Elements and Flow



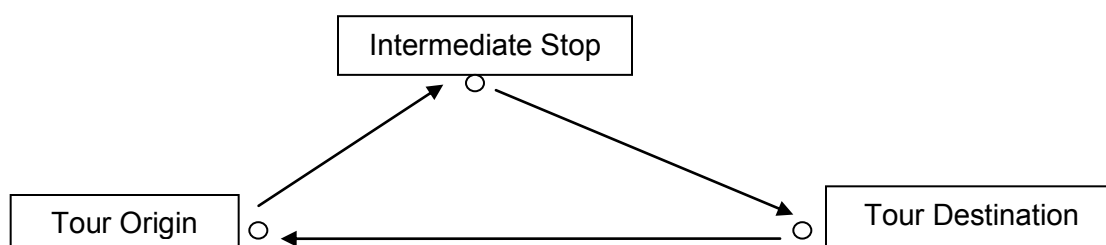
Focus Model Process Overview

Figure 3 shows a simplified diagram of how the *Focus* model components flow after the socioeconomic forecast has been completed.

First, travel time and cost information between zones are calculated by mode and time of day. Tours are the first travel elements to be created, considering the travel times and costs. Figure 4 shows a diagram to explain how tours are related to trips. This example diagram has one tour composed of three trips (shown as individual arrows), and one intermediate stop.

The model then runs through a set of steps for each tour, including activity generation, location choice, mode choice, and time of day choice model components. Then the model runs through a parallel set of model components for each trip within a tour.

Figure 4
Tour Diagram



Highway and Transit System

One of the most significant inputs to all travel model components is the transportation network representation. The highway network is represented by over 25,000 directional road segments, described by location, length, number of lanes, functional classification, and area type. High-occupancy vehicle (HOV) lanes also are represented as special links. Tollway links are assessed an additional impedance to reflect toll charges. The model also includes a fully detailed representation of transit facilities, including all bus and rapid transit lines, Park-n-Ride lots, bus stops, and walk access/egress routes. Bus routes follow the same highway network as auto trips, and bus speeds are based on auto speeds. Rail speeds are developed based on transit schedule information. Capture areas for Park-n-Ride lots are quite broad, permitting trip-makers in the model to select the lot that produces the most convenient overall transit path to their destination. As part of the process of estimating highway and transit use, minimum impedance paths are

calculated using time, distance and toll cost over the highway and HOV system, and time and cost over the transit system.

Model Components

The most important model components are briefly described in the sections below, and Table 1 lists all model components. Most model components are multinomial logit or nested logit models, which are statistical models that have two or more discrete choice outcomes.

Table 1. Focus Model Components

1. TransCAD Initialization	14. Tour Time of Day Simulation
2. Size Sum Variable Calculator	15. Tour Primary Destination Choice
3. TransCAD Trip Generation	16. Tour Priority Assignment
4. TransCAD Skimming (Path Selection)	17. Tour Main Mode Choice
5. TransCAD Airport, Commercial Vehicle, and External Travel Distribution and Mode Choice	18. Tour Time of Day Choice
6. Regular Workplace Location	19. Intermediate Stop Generation Choice
7. Regular School Location	20. Trip Time of Day Simulation
8. Auto Availability	21. Intermediate Stop Location Choice
9. Aggregate Destination Choice Logsum Generation	22. Trip Mode Choice
10. Daily Activity Pattern	23. Trip Time of Day
11. Exact Number of Tours	24. Write Trips To TransCAD
12. Work Tour Destination Type	25. TransCAD Highway and Transit Assignment
13. Work-Based Subtour Generation	

Highway and Transit Skims (Path Selection)

The highway and transit paths are chosen for all origin-destination zone pairs and times-of-day by finding the most convenient paths that balance the travel time, travel cost, and other considerations. The time and cost matrices are used extensively in later model components such as location choice, mode choice, and time of day choice.

Denver International Airport/Commercial Vehicle/Internal-External/ External-External Trips

After optimal paths are identified, the Compass 4.0 model components must be run for airport trips, internal-external trips, commercial vehicle trips, and external-external trips. The entire Compass model must be run to generate and assign these trips.

Regular Workplace and School Location

The work location choice model takes all regional workers and assigns them a regular work location zone and point. Characteristics of the worker and their home zone are used in combination with zonal characteristics to determine the desirability of any zone.

Similarly to the regular work location choice model, the regular school location choice model assigns each student a regular school location zone and school. The model uses information about the student, such as income and age, and information on school enrollment and distance from home to school to determine which schools will be attractive for which students. There are four school location choice models by student grade level: pre-school, kindergarden-8th grade, 9th-12th grade, and university. Four separate models are used to reflect that the decision-making of school location for different grade ranges has significantly different characteristics. The models are all multinomial logit with the choice being the location of the school zone.

Auto Availability Choice

The auto availability choice model is a multinomial logit model that selects number of automobiles available for each household in the region. The choices range from no cars to 4+ cars. The model uses information about households and their accessibility to work and school to determine how many autos are available to households.

Tour Models

After *Focus* has projected the long-term decisions about work and school location and auto ownership, it forecasts daily activities on a tour-level.

The **day activity pattern** model determines which combinations of up to seven purposes (work, school, escort a family member, personal business, shopping, dining, and social or recreational) a person will make tours or stops along a tour.

The **exact number of tours** model determines exactly how many tours of each type each person will make in his or her day. The tour types predicted for each person include: work, school, escort, personal business, shop, meal, and social recreation. The model outputs this number of tours by purpose into the tours table in the database.

The **work tour destination type** model determines whether a person making a work tour will travel to his or her usual work location, or somewhere else, perhaps to meet with clients or customers, or for off-site training. If the regular workplace is selected, this information is entered into the tours table in the database.

Work-based subtour generation determines whether someone will leave their regular workplace and return during the middle of the day. Such a person may be eating out or running errands during his or her lunch break. She or he might also be attending meetings with colleagues in related firms, or with government regulators, for example. After this point, the *Focus* model treats work-based subtours similarly to home-based ones.

In reality, a person might consider the interactions of destination, mode, and departure time choices together in creating an itinerary for the day's travel and activities. Despite its complexity, the *Focus* model needs to have some simplifying assumptions to make its mathematical relationships and software workable. **Tour time of day simulation** is one such simplification, allowing destination and mode choices to be modeled as if the time of travel is known (so the right time and cost matrices can be used) as an initial guess. The simulated times of days are based on observed survey distributions. The later **tour time of day choice** confirms whether the initially simulated time of day was reasonable, or whether a shift earlier or later might be justified.

The **tour primary destination choice** model selects the destination of tour based the development (e.g. jobs and households) located within the zone. It then assigns a point within each zone as the final destination.

After the tour destination is known, the ***tour main mode choice*** model predicts the main travel mode used on the tour. The mode chosen is based on the impedances associated with each mode from the tour origin to the tour destination, zonal characteristics, and demographic person characteristics. The tour main mode is used for most of the distance of the tour, but not necessarily for all trips. For example, if a parent is driving a child to school, the return trip would not necessarily be driving alone. In other cases, stops along a tour might be close enough that walking or biking would be more attractive than a motorized tour mode. The tour and trip modes are related by rules of precedence used to simplify the *Focus* model.

Given the known tour origin, destination and mode from previous models, the ***tour arrival and departure time model*** predicts the time arriving at the primary destination of the tour and the time leaving the primary destination, both to within one hour periods.

Trip Models

After the tour-level models are run, a series of trip-level models are run. The first trip level model is the ***intermediate stop generation*** model, which determines the number of intermediate stops on each tour (if any).

As with the tour models, there is a ***trip time of day simulation*** component to simplify the location and mode choices that are modeled next.

The ***intermediate stop location choice*** model selects the zone for each intermediate stop. The locations of all intermediate stops on tours are modeled one at a time, first for stops from home to the primary activity and then for stops from the primary activity to home.

The ***trip mode choice*** model determines the trip mode on all trips. The tour mode has already been found by the tour mode choice model, and this knowledge is used in combination with skim data, zonal data, and person data to find the trip modes on these tours.

Given the origin, destination and mode of each trip, the ***trip time of day choice*** model predicts the time each intermediate stop will occur. The trip time of day choice model has 24 alternatives corresponding to each hour period.

After the trip models have been run, the following information is known for every trip internal to the region:

- Origin and Destination Zone and Point Location
- Trip Purpose (work, school, escort, personal business, shop, social recreation)
- Trip Mode (drive alone, shared ride 2, shared ride 3+, walk to transit, drive to transit, walk, bike, school bus)
- Trip Time of Day (one of 24 hours)
- Which tour the trip is part of
- What person made the trip
- What household the person who made the trip belongs

The ***write trips to TransCAD*** component assembles the individual records for auto and transit trips into origin-destination trip tables (matrices) that TransCAD can use for assignment. These trip tables are then combined with those developed for DIA, commercial vehicle, internal-external, external-internal, and external-external trips developed earlier.

Network Assignment

Automobile trips are assigned to the highway network via a “user equilibrium” algorithm, after commercial trips have been loaded first using an “all-or-nothing process.” The all-or-nothing process simply assigns trips to the shortest path between origin and destination, ignoring possible congestion effects that might cause trips to take different paths. The user equilibrium process assigns the trips between each origin and each destination TAZ in such a way that, at the end of the process, no trip can reduce its travel time by changing its path. In other words, taking into account the congestion produced by all other trips in the region, each trip is following its minimum path. High-occupancy vehicles (HOV) are loaded simultaneously with single-occupant vehicles (SOV). During this process, TransCAD keeps track of which vehicles are eligible to use HOV facilities, and which might need to pay a toll to use High-Occupancy/Toll (HOT) lanes, such as the reversible I-25 Express Lanes north of downtown Denver. The model also takes into account the effect of toll costs in roadway route choice by converting toll costs into equivalent time cost using an estimated value of time for automobile trip-makers.

Transit assignment is performed separately, using an all-or-nothing algorithm that does not take into account the possibility that high demand on some transit routes may motivate some riders to shift routes, or that other riders may not be able to board when a train or bus is full. RTD has

special modeling tools that allow them to use *Focus* model forecasts for more detailed operational planning.

Finally, the model is run several times, feeding back the output speeds from highway assignment to the input stages that require them as input (among them, the trip distribution stage) until the output speeds and the input speeds match closely enough.

Model Calibration

In developing the 2040 RTP, each *Focus* model component was calibrated using 2010 inputs and comparing the resulting "forecast" to 2010 external data sources such as roadway counts and RTD transit boardings, both individually and from a region-wide perspective.

When the *Focus* model was initially developed, external data from 2005 was used wherever possible to ensure that the model was correctly capturing observed 2005 Denver travel behavior when 2005 inputs were used in the model. The following 2005 datasets were used to calibrate against:

- 2005 American Community Survey (ACS)
- 2005 Colorado state demographer data
- 2005 Colorado Department of Transportation (CDOT) highway counts
- 2005 HPMS estimated regional VMT
- 2005 Regional Transportation District (RTD) transit boardings and 2005 Compass trip-based model results

In the spring of 2012, and again in fall of 2014, the model was again calibrated, these times using observations of highway volume and transit boardings from 2010.

Once comparisons were made of model results against the observed datasets, each model component was calibrated. The calibration involved changing the coefficients describing the mathematical models and travel, and adding variables. Then the model was re-run, results compared again, and modifications made again. This process was repeated until satisfactory results were achieved.

The major regional level model results of the calibration are shown in Table 2 and Table 3. These tables demonstrate that the aggregate model results match the observed counts and transit boardings sufficiently well. When summed over the region, the links with counts were observed to carry about 28.0 million vehicles per weekday, while Focus is showing 0.2 million additional vehicles, or less than a one percent difference.

**Table 2. Sum of Observed Counts & Modeled Volumes
on (Non-Tollway) Links with Counts**

Sum of Observed Counts	Sum of Modeled Counts
27,966,475	28,200,000

Table 3. Observed and Modeled Transit Boardings

Observed Transit Boardings	Modeled Transit Boardings
317,645	355,000

Air Quality Modeling

Formal air pollutant emissions modeling is conducted by the APCD. However, DRCOG, the APCD, and other agencies work closely together in this effort, both in developing the modeling techniques, assumptions, and parameters, and in executing the model runs. Travel model results are, of course, one of the principal inputs to the air pollutant emissions model. The model produces estimates of the amount of emissions of carbon monoxide (CO), volatile organic compounds (VOCs), oxides of nitrogen (NOx), and particulate matter (PM10) generated by motor vehicles. The results are then combined with numerous assumptions concerning meteorology and atmospheric chemical reactions to produce air pollutant concentration estimates.

APPENDIX C

PM10 STREET EMISSIONS REDUCTION COMMITMENTS

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2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

Arapahoe County

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	55 %
	2025	55 %
	2035	55 %
	2040	55 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.


Name

April 24/14
Date

Director of Public Works
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Aurora

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	<input type="text" value="45"/> %
	2025	<input type="text" value="45"/> %
	2035	<input type="text" value="45"/> %
	2040	<input type="text" value="45"/> %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Name G. Noe

5/1/14
Date

City Manager
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Boulder

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	<input type="text" value="70"/> %
	2025	<input type="text" value="70"/> %
	2035	<input type="text" value="70"/> %
	2040	<input type="text" value="70"/> %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Jan S. Brautigan

Name

5/16/14

Date

City Manager, City of Boulder

Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.


2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

Boulder County

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	31 %
	2025	31 %
	2035	31 %
	2040	31 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

DocuSigned by:

6E741196D6C0495.

May 20, 2014

Name

Date

Vice-Chair, Board of County Commissioners

Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City and County of Broomfield

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	68.2 %
	2025	68.2 %
	2035	68.2 %
	2040	68.2 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Chad Gabe
Name

6/11/14
Date

City & County Manager
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

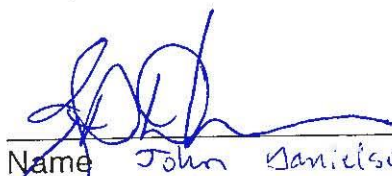
2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Centennial

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	30 %
	2025	30 %
	2035	30 %
	2040	30 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.


Name John Danielson

5/28/14
Date

City Manager
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

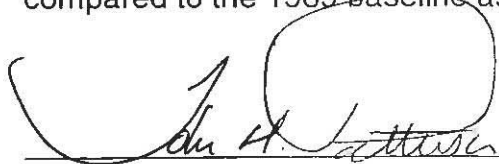
2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Cherry Hills Village

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	<div>55</div> %
	2025	<div>55</div> %
	2035	<div>55</div> %
	2040	<div>55</div> %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.



Name

05/14/14

Date

CITY MANAGER

Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

Colorado Dept. of Transportation, Region 4

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	<input type="text" value="55"/> %
	2025	<input type="text" value="55"/> %
	2035	<input type="text" value="55"/> %
	2040	<input type="text" value="55"/> %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Eddie Gentry
Name

5/12/14
Date

LTC OPS I
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City and County of Denver

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
Sweep Box	2015	68 %
	2025	68 %
	2035	68 %
	2040	68 %
Denver CBD	2015	72 %
	2025	72 %
	2035	72 %
	2040	72 %
General PM10 Modeling Domain	2015	60 %
	2025	60 %
	2035	60 %
	2040	60 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

JOSE M. GALVEZ
Name

6/19/14
Date

EXECUTIVE DIRECTOR PUBLIC WORKS
Title

JOSE M. GALVEZ
Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

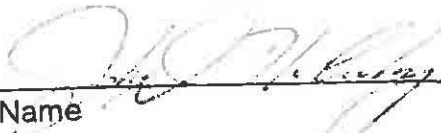
2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

E-470 Public Highway Authority


PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	45 %
	2025	45 %
	2035	45 %
	2040	45 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.


Name

6/12/14
Date


Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Englewood

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	53.3 %
	2025	53.3 %
	2035	53.3 %
	2040	53.3 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Larry Lewis
Name

5/22/14
Date

City Manager
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

Town of Foxfield

PM10 Emission Reduction Conformity Commitments		
Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	64 %
	2025	64 %
	2035	64 %
	2040	64 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Cheryl Kueckearneister
Name

6/6/14
Date

Town Administrator
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.


2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Greenwood Village

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	57 %
	2025	57 %
	2035	57 %
	2040	57 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.


Name

5/22/14
Date


Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

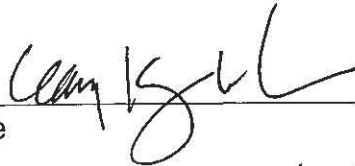
City of Lafayette

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	64 %
	2025	64 %
	2035	64 %
	2040	64 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

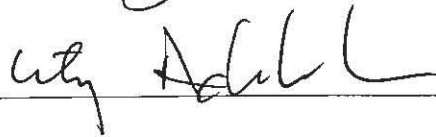
Name



Date

4/14/14

Title



Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Lakewood

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	45 %
	2025	45 %
	2035	45 %
	2040	45 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Kathleen E. Hodgson
Name

6/8/14
Date

Lakewood City Manager
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Louisville

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	68.3 %
	2025	68.3 %
	2035	68.3 %
	2040	68.3 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Malcolm Fleming
Name

8/9/14
Date

City Manager
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.


2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Northglenn

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	51.6 %
	2025	51.6 %
	2035	51.6 %
	2040	51.6 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.



Name



Date



Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

Town of Parker

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	60 %
	2025	60 %
	2035	65 %
	2040	65 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

C. J. Long
Name

05/14/14
Date

TOWN ADMINISTRATOR
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Sheridan

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	40.4 %
	2025	40.4 %
	2035	40.4 %
	2040	40.4 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Randy Mourning
Name

06/09/2014
Date

Superintendent
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Thornton

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	60 %
	2025	60 %
	2035	60 %
	2040	60 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.

Jayne Hunt
Name

4-23-14
Date

Assistant City Manager
Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

2040 Regional Transportation Plan Conformity PM10 Emission Reduction Commitments

City of Wheat Ridge

PM10 Emission Reduction Conformity Commitments

Geographic Area of Commitment	For Staging Years	Emission Reduction Commitment
General PM10 Modeling Domain	2015	55 %
	2025	55 %
	2035	55 %
	2040	55 %

It is our intention to pursue the above percentages of PM10 emission reductions compared to the 1989 baseline as goals for the years noted.



Name (PATRICK GOFF)

5-28-14

Date

CITY MANAGER

Title

Signature needed from Chairman, County Board of Commissioners,
Mayor/City Manager of Municipality, or Agency Executive Director.

APPENDIX D

U.S. DEPARTMENT OF TRANSPORTATION CONFORMITY FINDING

(TO BE PROVIDED)

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APPENDIX E

LIST OF ACRONYMS

ACT	Agency Coordination Team
APCD	Air Pollution Control Division
AQCC	Air Quality Control Commission
BNSFRR	Burlington Northern Santa Fe Railroad
CAMP	Continuous Air Monitoring Project
CDOT	Colorado Department Of Transportation
CMAQ	Congestion Mitigation Air Quality
CO	Carbon Monoxide
DRCOG	Denver Regional Council Of Governments
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
MPO	Metropolitan Planning Organization
MVRTP	Metro Vision Regional Transportation Plan
NAAQS	National Ambient Air Quality Standards
NO	Nitrogen Oxide
PM	Particulate Matter
Ppm	Parts per Million
RAQC	Regional Air Quality Council
RTD	Regional Transportation District
RTP	Regional Transportation Plan
SIP	State Implementation Plan
TCM	Transportation Control Measures
TDM	Transportation Demand Management
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TMO	Transportation Management Organization
TSSIP	Traffic Signal System Improvement Program
VOC	Volatile Organic Compounds