Policy Directive 1610.0

Subject:	Greenhouse Gas Mitigation Measures
Effective Date:	06/16/2023
Supersedes:	12/15/22
Originating Office:	Division of Transportation Development

I. Purpose

The purpose of this Policy Directive is to fulfill the requirements of the Rules Governing Statewide Transportation Planning Process and Transportation Planning Regions (the Rule), which directs the Colorado Department of Transportation (CDOT), in consultation with the Metropolitan Planning Organizations (MPOs), to establish an ongoing administrative process and guidelines for selecting, measuring, confirming, verifying, and reporting Greenhouse Gas (GHG) Mitigation Measures. CDOT and MPOs may use GHG Mitigation Measures in order to assist them in meeting the Regional GHG Planning Reduction Levels in 2 CCR 601-22. This Policy Directive sets forth the intent and principles of GHG mitigations and the process for establishing, tracking, and verifying mitigation measures. It further establishes the quantification methodology and the associated GHG reductions/scores for each measure.

II. Authority

Transportation Commission pursuant to § 43-1-106 (8)(a), C.R.S. § 43-128, C.R.S. 2 CCR 601-22, Rules Governing Statewide Transportation Planning Process and Transportation Planning Regions (the "Rule").

III. Applicability

This Policy Directive shall apply to all CDOT Divisions, Regions, Branches, and Offices as well as the state's current five MPOs: Denver Regional Council of Governments (DRCOG), North Front Range Metropolitan Planning Organization (NFRMPO), Pikes Peak Area Council of Governments (PPACG), Grand Valley Metropolitan Planning Organization (GVMPO), and Pueblo Area Council of Governments (PACOG), as well as any MPOs created during the lifetime of the Rule.

IV. Background

The broad purpose of this Policy Directive is to help achieve the objectives of the Rule, which is intended to reduce GHG emissions from the transportation sector.

Specifically, the Policy Directive fulfills the following requirement within 2 CCR 601-22, Section 8.02.4:

“By May 1, 2022, CDOT in consultation with the MPOs shall establish an ongoing administrative process and guidelines, through a public process, for selecting, measuring, confirming, verifying, and reporting GHG Mitigation Measures. CDOT and MPOs may incorporate one or more GHG Mitigation Measures into their plans in order to assist in meeting the Regional GHG Planning Reduction Levels in Table 1. Such a process and guidelines shall include, but not be limited to, how CDOT and MPOs shall determine the relative benefits and impacts of GHG Mitigation Measures, and measure and prioritize localized benefits to communities and Disproportionately Impacted Communities in particular. The mitigation credit awarded to a specific solution shall consider both regional and community benefits.”

GHG Mitigation Measures are an important, but voluntary, component of the Rule as they provide an additional option to demonstrate compliance with the GHG Reduction Levels (Table 1 in the Rule). For this reason, the GHG reductions achieved by GHG Mitigation Measures must be real, additional, quantifiable, and verifiable. GHG Mitigation Measures will be considered additional if it is not currently listed as a specific and quantified action in the GHG Roadmap or captured in an agency’s model. The GHG Mitigation Measures included in this Policy Directive--and the scores or reduction levels assigned to these measures--are based on the best available research, calculation methodology and forecasting tools available nationwide.

It also is important to understand how GHG Mitigation Measures relate to transportation plans (“Applicable Planning Documents” in the Rule), which include a range of projects-- from roadway expansions to new transit and bike lanes. The Rule requires CDOT and MPOs to model “at a minimum… Regionally Significant Projects" to demonstrate compliance. The words “at a minimum” give the flexibility to model projects that are not Regionally Significant. This approach has the benefit of providing a full analysis of all the projects within a plan and, further, of realizing the benefits of a model to capture the interrelationships of these strategies across the transportation network. However, not all projects can be accurately modeled yet. This is either because they are too small to be detected within a model (e.g. a segment of bike lane) or are beyond the current overall capability of an agency’s model. Thus, this Policy largely focuses on GHG Mitigation Measures that cannot yet be accurately quantified within CDOT or an MPO’s travel demand modeling runs. The Commission recognizes that this dynamic will change over time. As models continue

to improve, transportation system elements currently treated as GHG Mitigation Measures may be incorporated into the models which may require amendments to this Policy.

V. Definitions

The defined terms in this Policy Directive have the same meaning as in the Rule except as explicitly set forth herein. Some definitions are repeated here for convenience.

“Applicable Planning Document”, as stated in the Rule (1.02), are MPO Fiscally Constrained Regional Transportation Plan (RTP), Transportation Improvement Program (TIP) for MPOs in Non-Attainment Areas, CDOT’s 10-Year Plan and Four-Year Prioritized Plan in Non-MPO areas, and amendments to the MPO RTPs and CDOT’s 10-Year Plan and Four-Year Prioritized Plan in Non-MPO areas that include the addition of Regionally Significant Projects.

“Disproportionately Impacted Communities”, as stated in the Rule (1.11), is defined in § 24-38.5-302(3), C.R.S. as a community that is in a census block group, as determined in accordance with the most recent United States Decennial Census where the proportion of households that are low income is greater than forty percent (40%), the proportion of households that identify as minority is greater than forty percent (40%), or the proportion of households that are housing cost-burdened is greater than forty percent (40%).

“Greenhouse Gas (GHG)”, as stated in the Rule (1.16), are pollutants that are anthropogenic (man-made) emissions of carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride

“GHG Mitigation Measure Equity Standards” is a document being developed in collaboration with CDOT’s Environmental Justice and Equity Branch and the MPOs which will guide the process of evaluating benefits and burdens of GHG Mitigation Measures for Disproportionately Impacted Communities.

“Greenhouse Gas (GHG) Mitigation Measures”, as stated in the Rule (1.18) or “Mitigation Measures”, are non-Regionally Significant Project strategies that reduce transportation GHG pollution and help meet the GHG Reduction Levels.

“Greenhouse Gas (GHG) Reduction Level”, as stated in the Rule (1.17), is the amount of the GHG expressed as CO2e reduced that CDOT and MPOs must attain through transportation planning.

“GHG Transportation Report” is the report that is required to be submitted as part of the Rule which shows compliance toward meeting the reductions levels.

“Metropolitan Planning Organization" or “MPO”, as stated in the Rule (1.28), is an organization designated by agreement among the units of general purpose local governments and the Governor, charged to develop the Regional Transportation Plans (RTPs) and programs in a Metropolitan Planning Area pursuant to 23 U.S.C. § 134. Colorado currently includes five designated MPOs: DRCOG, PPACG, PACOG, GVMPO and NFRMPO.

“Mitigation Action Plan” (MAP) is an element of the GHG Transportation Report that specifies which GHG Mitigation Measures shall be implemented that help achieve the GHG Reduction Levels.

“Off-Model” means tools are better suited to use independent of the travel model, including calculation methodology in order to quantify or estimate the effects of GHG reductions.

“Policy Directive” is a document adopted by the Transportation Commission that specifies organizational and Commission goals and policies and is used to help implement the Rule.

“Regionally Significant Project”, as stated in the Rule (1.42), is a transportation project that is on a facility which serves regional transportation needs (such as access to and from the area outside of the region, major activity centers in the region, major planned developments such as new retail malls, sports complexes, etc., or transportation terminals as well as most terminals themselves) and would normally be included in the modeling of a metropolitan area's transportation network or state transportation network, including at a minimum all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel. Modifications of this definition shall be allowed if approved by the State Interagency Consultation Team. If the MPOs have received approval from the Environmental Protection Agency (EPA) to use a different definition of regionally significant project as defined in 40 C.F.R. § 93.101, the State Interagency Consultation Team will accept the modified definition. Necessary specificity for MPO Models or the Statewide Travel Model will be approved by the State Interagency Consultation Team. The Transportation Commission may issue guidance for implementation of this definition based on population density or other defined factors from time to time.

"State Interagency Consultation Team" (IACT), as stated in the Rule (1.44), consists of the Division Director or the Division Director's designee, the Colorado Department of Public Health and Environment (CDPHE) Director of Air Pollution Control Division or the Director's designee, the Director of each MPO or their designee, and the Colorado Energy Office Director or Director's designee. The Division Director may appoint additional member(s) from outside of these organizations. The State Interagency Consultation Team works collaboratively and consults appropriately to approve modifications to Regionally Significant definitions, to address classification of projects as Regionally Significant, and to consult on issues that may arise regarding modeling assumptions and projects that reduce GHG emissions.

VI. Policy

The Transportation Commission adopts the processes and priorities stated herein to guide the development of GHG Mitigation Measures, the approval of new GHG Mitigation Measures, the elements of a Mitigation Action Plan and GHG Mitigation Measure Status Report, and the analysis of the efficacy of GHG Mitigation Measures. Due to the evolving nature of evaluation techniques it is expected that this Policy may be reviewed and amended in the early months and years of its adoption.

A. Overall Process for Establishing GHG Mitigation Measures

This Policy Directive includes a list of approved GHG Mitigation Measures (Appendix A) that have been reviewed, vetted, and scored by the Department's subject matter experts, reviewed and recommended by the Interagency Consultation Team, and provided to the Air Pollution Control Division as required by the Rule, Section 8.04.2.

This Policy recognizes the need to balance appropriate analytical rigor around the expected reductions of GHG Mitigation Measures with encouraging new ideas and adapting to advancements in measurement methodologies. Further, the Commission recognizes that in the early compliance period for the Rule, MPOs may identify valid and quantifiable GHG Mitigation Measures that are not contemplated in Appendix A. Thus, this Policy provides two pathways for including mitigation measures in a MAP: 1) Using an approved measure listed in Appendix A or 2) Proposing a new measure so long as the process outlined below for validating and reviewing a measure is followed.

A locally-driven project, not otherwise prompted or developed as a result of CDOT or MPO action (e.g. funded or directly incentivized) may be included in the Mitigation Action Plan if it is a GHG Mitigation Measure contained in Appendix A of this Policy.

1. Proposing and Approving New GHG Mitigation Measures

   i. Inclusion in Appendix A:

   Any individual or organization may nominate a new GHG Mitigation Measure for review and potential approval. CDOT shall develop an online form on CDOT's website to receive these nominations. Staff, in consultation with the Transportation Commission, reserves the discretion to prioritize newly nominated GHG Mitigation Measures based on the information available and the effort required to assess.

   Additionally, CDOT staff will establish a regular process of inventorying best practices from around the country with a focus on identifying a range of effective GHG Mitigation Measures for urban, suburban, and rural contexts throughout the state. Staff shall engage CDOT's Environmental Justice branch in this process to help ensure that GHG Mitigation Measures and policy updates are regularly adapted to, and developed with, input from Disproportionately Impacted Communities.

   In order to be included in Appendix A as an approved GHG Mitigation Measure, all new measures must follow the process outlined below:

   - Assessment by CDOT GHG Program staff according to the framework listed in Table 1. The individual or group submitting the new measure shall be expected to provide, to the extent possible, this information and data upon submission of a proposed GHG Mitigation Measure.
   - Review and recommendation by the Interagency Consultation Team.
   - Confirmation and verification by the Air Pollution Control Division (APCD) (as required by 8.04.2).
   - Approval by the Transportation Commission for incorporation into Appendix A.

Table VI-1- New GHG Mitigation Measure Submission Requirements

New GHG Mitigation Measure Submission Components	Description of New GHG Mitigation Measure
Strategy Description	Describe the overall strategy, including: ● The nexus with the transportation sector ● Description of what the strategy achieves or implements ● Description of how the strategy reduces CO2e emissions ● If possible, identification of how the strategy is not already reflected--or cannot be accurately measured by--land use and travel modeling tools, thus warranting an off-model estimate of CO2e emission reductions ● Description of additionality. A GHG Mitigation Measure will be considered additional if it is not currently listed as a specific and quantified action in the GHG Roadmap or captured in an agency's modeling.
Quantification Methodology	Describe the methodology for quantifying CO2e emissions reductions from the strategy, including: ● Empirical evidence supported by verifiable data sources ● Clearly document all assumptions, sources of data, and calculations
Challenges and Constraints	Potential challenges and constraints with quantifying and implementing strategy

ii. Including a Mitigation Measure in a MAP not included in Appendix A:

If a GHG Mitigation Measure is not included in Appendix A, but submitted as part of a MAP, such measures must include the information in Table 1 and follow the process outlined below. CDOT staff shall work expeditiously to review new Mitigation Measures and support each submittal through this process.

Assessment by CDOT GHG Program staff according to the framework listed in Table 1.

Review and approval by the Interagency Consultation Team.

Confirmation and verification by the Air Pollution Control Division (APCD) (as required by 8.04.2).

The Commission shall revisit this provision by May 2023 to determine its necessity and effectiveness based on the experience of the initial compliance period (i.e. October 2022 deadline).

B. Process for Scoring Approved GHG Mitigation Measures

Approved GHG Mitigation Measures will be scored and the scores included in Appendix A. The scoring is related to the ability of a GHG Mitigation Measure to reduce GHG emissions relative to a certain unit (e.g. per mile of bike lane). It also provides a way to distinguish and value the location and context of GHG Mitigation Measures.

The scores are based on the following factors:

1. Metric (e.g. per mile of bike lane)
2. Tons/unit
3. Additional multipliers
4. Adjustment for effectiveness over time, and
5. A total expected lifetime of each measure

C. Measuring and Prioritizing GHG Mitigation Measures Benefits to Disproportionately Impacted Communities

Section 8.02.4 of the Rule stipulates that this Policy Directive shall include a process and guidelines for "how CDOT and MPOs should determine the relative benefits and impacts of GHG Mitigation Measures, and measure and prioritize localized benefits to communities and Disproportionately Impacted Communities in particular". To measure the benefits of project- specific GHG Mitigation Measures in Disproportionately Impacted Communities, agencies shall use the tool outlined in the GHG Mitigation Measures Equity Standards document developed in partnership with CDOT's Environmental Justice and Equity Branch and MPOs. The GHG Mitigation Measure Equity Standards will be updated as needed to reflect the best practices and latest data on measuring transportation inequity relief.

Prioritizing project benefits in Disproportionately Impacted Communities will be addressed in a subsequent effort by CDOT's Environmental Justice and Equity Branch to establish a more comprehensive transportation equity framework.

Given the nearly 30-year lifetime of the rule, some planned GHG Mitigation Measures in agencies' GHG Mitigation Action Plans may lack the specificity needed to measure project benefits to communities and Disproportionately Impacted Communities. As such, agencies may either measure equity benefits in GHG Mitigation Action Plans or in GHG Mitigation Measure Status Reports, as project specifics become clearer. As

noted above, this tool currently is only applicable to project-based mitigation measures.

D. GHG Mitigation Action Plan

Subsection 8.02.6.3 of the Rule states as follows: "If (GHG) Mitigation Measure(s) are needed to count toward the GHG Reduction Levels in Table 1, the MPO or CDOT may submit a Mitigation Action Plan that identifies GHG Mitigation Measures, if any, needed to meet the GHG Reduction Levels within Table 1". The Transportation Commission will evaluate Mitigation Action Plans and determine their sufficiency to assure that the Plan meets the GHG Reduction Levels needed for compliance.

The following information must be included in a Mitigation Action Plan:

a. GHG Emissions Reductions: Summary of emissions analysis from GHG Transportation Report, including the estimated gap to achieve the GHG Reduction Levels specified for each horizon year.

b. b. GHG Mitigation Measure Summary/Description: Each measure shall include the following details as listed in Table 2.

Table VI-2 - Description for Each Mitigation Measure

Component	Description of information to be submitted with application
Measure Description	A description of the measure, including scale, location, and how it would affect travel activities expected to result in GHG reductions.
Timing	Anticipated start date, completion date, and dates of any other key milestones.
GHG Reductions	If using the tons as set up in Appendix A, record the GHG reductions and associated technical data in each year of the project's lifetime. If agencies would like to substitute specific local data for the inputs or parameters that form the basis of the calculation methodologies of the strategies in Appendix A, document the GHG reductions and associated technical data. Agencies shall work with CDOT technical staff to verify the new technical data inputs.

Component	Description of information to be submitted with application
	If using a GHG Mitigation Measure that is not included in Appendix A, document the GHG reductions and associated technical data listed in Table 1 used to calculate the GHG emissions reductions of the strategy. The Commission notes that there is a risk of disapproval under this scenario due to the Commission reviewing without the benefit of being pre-approved through the Appendix A process.
Co-benefits	Quantification, where possible, of specific co-benefits including reduction of co-pollutants (PM2.5, NOx, etc.) as well as travel impacts (changes to VMT, pedestrian/bike use, transit ridership, etc. as applicable), for each relevant compliance year in the project's lifetime.
Benefits to Disproportionately Impacted Communities	A description of the benefits and burdens to Disproportionately Impacted Communities based on the methodology in the GHG Mitigation Measure Equity Standards document and a description of any stakeholder engagement conducted with those communities. Include an accounting of the amount of mitigation dollars directly spent in--or designed to serve--Disproportionately Impacted Communities as a subset of total dollars.
Measure Origin and History	Include a description of the origin of the measure, including, where applicable, the role of the MPO or CDOT. Description must explain how the GHG Mitigation Measure is additional per the guidance provided above. A GHG Mitigation Measure will be considered additional if it is not currently listed as a specific and quantified action in the GHG Roadmap or captured in an agency's modeling. A locally-driven project, not otherwise prompted or developed as a result of CDOT or MPO action (e.g. funded or directly incentivized) may be included in the Mitigation Action Plan if it is a GHG Mitigation Measure contained in Appendix A of this Policy. If a project was specifically identified in a previous fiscally constrained plan as of January 30, 2022, it is not eligible as a GHG Mitigation Measure in a new plan UNLESS the new GHG Mitigation Measure is funded from a pool of non-specific projects (and not otherwise modeled in a previous plan), in which case it may be used as a GHG Mitigation Measure in the new plan.

Component	Description of information to be submitted with application
Funding/ Resources/ Partnerships	Funding source(s), including if those funds are confirmed if any partnerships have been made or in-kind/matches are included.
Other Info As Needed	Any other relevant information that may be needed for thorough review of the proposed GHG Mitigation Measure.

E. GHG Mitigation Measures Status Reports and Follow-Up Analysis

1. Submitting a GHG Mitigation Measure Status Report

Following the approval of a GHG Mitigation Action Plan, CDOT and the MPOs are required to submit an annual status report for each GHG Mitigation Measure to the Transportation Commission starting on April 1 of each calendar year subsequent to the approval of the MAP. The following information shall be included in each status report (as outlined in the Rule):

- The implementation timelines;
- The current status
- For measures that are in progress or completed, quantification of the annual benefit of such measures
- For measures that are delayed, canceled, or substituted, an explanation of why that decision was made and, how these measures or the equivalent will be achieved
- For measures located in a Disproportionately Impacted Community that are delayed, canceled, or substituted, an explanation of why that decision was made and, how these measures or the equivalent will still be achieved in Disproportionately Impacted Communities
- Description of the benefits and burdens to Disproportionately Impacted Communities based on the methodology in the GHG Mitigation Measure Equity Standards document and a description of any stakeholder engagement conducted with those communities

If an agency fails to implement or find a substitute for a delayed or canceled GHG Mitigation Measure, the Commission will need to consider whether an Applicable Planning Document is in compliance, as per subsection 8.02.6.4 of the Rule. The Commission shall consider failure to

submit reports and any analysis therein in subsequent review of future plans presented for consideration.

2. Analyzing the Efficacy of GHG Mitigation Measures

CDOT shall create a process to evaluate the effectiveness of implemented GHG Mitigation Measures against predicted achievement of those measures by no later than the end of 2026 and annually thereafter if needed. Such analysis shall be provided to the Interagency Consultation Team for their review and consideration as to whether this information merits a change to the score applied to relevant measure(s). The Commission shall incorporate subsequent review and revisions into this Policy Directive. Further, CDOT and MPOs shall conduct ongoing review in advance of the next plan update in order to better understand how GHG Mitigation Measures are being developed and implemented.

VII. Implementation Plan

This Policy Directive shall be effective immediately upon approval by the Transportation Commission.

The Office of Policy and Government Relations shall post this Policy Directive on CDOT's intranet as well as on public announcements.

VIII. Review Date.

This Directive shall be reviewed by January 2028.

Herman F. Stockinger III _____ 6-16-2023

Herman Stockinger Date of Approval

Transportation Commission Secretary

IX. Appendix A

X. Table of Contents

XI. Guide for all tables:

- Lifetime Effectiveness of GHG Mitigation Measures: The table lists the number of years after implementation or expenditure for which a strategy remains effective. Some infrastructure projects have long lasting effects, while other programs must be annually reinstated e.g., transit operations and parking pricing. For those programs that must be annually reinstated, agencies may take credit for as many years as the applicable planning document commits to funding said program. An agency may take credit for the GHG reductions of a given project over its lifetime effectiveness.
- Agencies may take partial credit for any of these measures, i.e. if an agency builds half a mile of bike lane in an urban area, it may take half the tons (6 tons).
- Year of emissions factor basis for tons: now-2025: 2025; 2026-2030: 2030; 2031-2040: 2040; and 2041-2050: 2050
- For all strategies in this Appendix, “core urban” corresponds to census tract or block group population density of greater than 10,000; “urban” to density between 4,000 and 10,000 persons per square mile; “suburban” to density between 500 and 4,000 persons per square mile; and “rural” to density of less than 500 persons per square mile. If there is evidence to show that a census tract or block group’s population density will grow (e.g. shift from rural to suburban), agencies may claim a different density for a project.
- “Evaluation year” is the year for which projected GHG mitigation is being compared against a target, i.e., 2025, 2030, 2040, 2050.
- The ditto mark notation (**“**) in the unit or additional multiplier column indicates that the unit or additional multiplier for that project type is the same as the cell above. In the case where the cell above a ditto mark also contains a ditto mark, the reader should continue to follow the table cells upwards until an in-text unit/additional multiplier is shown.

Table IX-1 GHG Tons Estimate Calculation Methodologies – Pedestrian and Bicycle Strategies

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Bike lane/facility[1] – core urban	Miles of two-way facility built between plan year 1 and evaluation year	30	26	21	12	6	2.0 – separated/protected lane or bike boulevard
Bike lane/facility - urban	"	30	14	11	7	3	"
Bike lane/facility – suburban	"	30	4	4	2	1	"
Bike lane/facility – rural	"	30	1	1	1	1	"
Sidewalk/pedestrian facility - core urban	"	30	28	23	13	6	"
Sidewalk/ pedestrian facility - urban	"	30	9	7	4	2	"
Sidewalk/ pedestrian facility - suburban	"	30	1	1	1	1	1.5 – within mixed-use district or ½ mi of transit station or school
Sidewalk/ pedestrian facility – rural	"	30	1	1	1	1	"
Shared-use path[2] - core urban	"	30	84	69	40	19	"
Shared-use path - urban	"	30	39	32	18	9	"
Shared-use path – suburban	"	30	10	8	5	2	"
Shared-use path – rural	"	30	2	2	1	1	"

[1] "Sharrows" are not considered bike facilities in this application; however, a bike boulevard (low-volume street that includes pavement markings, signage, and traffic calming measures) is considered a bike facility. A "mixed-use district" is a street along which both residential and commercial (including retail) uses are permitted by zoning and where multiple non-residential uses (including retail) are present or planned.

[2] A shared use path is a facility that is physically separated from motorized vehicular traffic by an open space or barrier, either within the highway right-of-way or within an independent right of way, and with minimal cross flow by motor vehicles. Shared use paths should have a minimum width of 8' for two-way traffic, while 10 - 12' is desired.

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
"Complete Streets"[3] reconstruction - core urban	"	30	54	44	26	12	2.0 – separated/protected lane or bike boulevard 1.5 – within mixed-use district or ½ mi of transit station or school
"Complete Streets" reconstruction - urban	"	30	22	18	11	5	"
"Complete Streets" reconstruction - suburban	"	30	5	4	2	1	"
Bikeshare	Per 100 vehicles in service in evaluation year	1	18	15	9	4	None
Scooter share	"	1	18	14	8	4	None

[3] Reconstruct streets to include or enhance bicycle and pedestrian facilities as well as transit priority treatments if appropriate.

Table IX-2 GHG Tons Estimate Calculation Methodologies – Transit Strategies

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
New/increased fixed-route transit service[4] -electric	Per 1,000 additional vehicle revenue-hours[5] in evaluation year	1	31	25	15	7	None
New/increased fixed-route transit service -electric/diesel fleet average	"	1	1	4	5	7	None
New/increased fixed-route transit service - intercity[6] fleet average bus	Per 1,000 vehicle revenue-miles	1	2	2	1	1	None
New/increased fixed-route transit service - intercity electric bus	"	1	3	3	1	1	None
Waive transit fares 25%	Per million annual trips current ridership base	1	69	57	33	16	None
Waive transit fares 50%	"	1	139	115	67	32	None
Waive transit fares 100%	"	1	277	229	133	63	None

[4] Some new transit projects may yield higher GHG reductions if the agency supplies local specific data. CDOT and the MPOs may use the "Transit GHG Mitigation Measure User Input Tool" found on the CDOT GHG webpage as an alternative to the tons in this table when evaluating the GHG reductions impact of new or expanded transit services.

[5] Expressing service expansion in vehicle-hours captures a wide range of specific actions including adding route-miles, reducing headways, and extending service hours or days. Ridership elasticities are available to relate to overall service metrics, but will be less available for more specific actions. Data to support ridership response to other improvements (e.g., bus stops and other amenities) will be less available.

[6] Intercity transit services that cross multiple regional and metropolitan areas, e.g. CDOT's Bustang. Intercity buses have a more efficient driving cycle due to use of the highway.

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Implement bus priority treatments[7]	Per 1,000 vehicle revenue-miles per weekday of affected service in evaluation year	30	37	26	13	6	None
New/increased demand-response bus service	Per 1,000 new vehicle revenue hours	1	-	-	1	2	None

Table IX-3 GHG Tons Estimate Calculation Methodologies – Transportation Demand Management Strategies

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Trip Reduction program[8] - voluntary	Per 1,000 covered employees	1	108	89	52	24	None

[7] Infrastructure and/or operational improvements to reduce run times and improve reliability. These may include transit signal priority, queue jump lanes, exclusive bus lanes, bulb-outs, and/or other treatments. Bus priority treatments will need to meet minimum standards, e.g., anticipated >+10% travel time reduction on high-frequency (<=20 min headway) routes.

[8] Minimum requirements for such programs include staff dedicated to performing outreach to employers to promote and provide information on travel options for employees; resources for employers to communicate travel options to employees (e.g., websites, flyers, social media, trip planning tools, model telework policies, vanpool support); guaranteed ride home program; ride matching platform; incentives for participation (e.g., prizes, recognition); and support for measuring and tracking performance (e.g., participation in alternative mode use) via apps or surveys.

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Trip Reduction marketing	Per program $1,000 expenditure in evaluation year	1	2	2	1	1	None
Employer sponsored vanpool	Per new vanpool in evaluation year	1	2	1	1	1	None
Employer sponsored vanpool - electric	"	1	8	7	4	2	None
Carshare program	# of cars provided in evaluation year	1	15	13	7	3	3.0 for EVs
Telework	Per 100 employees teleworking additional 1 day/week	1	25	20	12	6	None
Broadband Expansion	Per 100 new households served	30	45	37	21	10	None

Table IX-4 GHG Tons Estimate Calculation Methodologies - Traffic Operations[9] Strategies

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Retime/optimize arterial signals	Per 10,000 AADT per signal optimized within five years prior to evaluation year	5	53	50	33	23	None
Replace signalized intersection with roundabout	Per 10,000 ADDT per roundabout	30	243	221	133	55	None

Table IX-5 GHG Tons Estimate Calculation Methodologies - Parking Management

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Reduce or eliminate commercial parking minimums and set maximum levels - Non-Central Business District , max 2.5 spaces/1,000 sq. ft.	Per 10,000 sq. ft. of gross floor area of commercial capacity in the area subject to the parking requirements between baseline plan year 1 and evaluation year	30	3	3	1	1	None

[9] The Rule requires that any operational GHG Mitigation Measure take into consideration induced demand. The GHG Mitigation Measure Calculation Methodology Workbook demonstrates how the tons for retiming/optimizing arterial signals were calculated with an induced demand factor. At this time, there is no conclusive evidence that roundabouts offer any travel time savings to drivers, thus induced demand is not a factor in this strategy.

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Reduce or eliminate commercial parking minimums and set maximum levels - Non-Central Business District, max 2.0 spaces/1,000 sq. ft.	"	30	8	4	4	2	None
Reduce or eliminate commercial parking minimums and set maximum levels - Central Business District, max 1.5 spaces/1,000 sq. ft	"	30	5	4	2	1	None
Reduce or eliminate commercial parking minimums and set maximum levels - Central Business District, max 1.0 spaces/1,000 sq. ft	"	30	10	8	5	2	None
Eliminate residential parking minimums and set low maximum levels[10] - core urban	Per 1,000 DUs[11] that can be built in the area subject to the parking requirements between baseline plan year 1 and evaluation year	30	1,535	1,265	734	347	None

[10] Maximums: no more than 0.75 (1 bed/studio/efficiency), 1.0 (2 bed), and 1.25 (3+ bed).

[11] Dwelling units.

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Eliminate residential parking minimums and set low maximum levels – urban	"	30	1,603	1,321	766	362	None
Eliminate residential parking minimums and set low maximum levels - suburban	"	30	1,841	1,517	880	416	None
Reduce or eliminate residential parking minimums and set moderate maximum levels[12] - core urban	"	30	767	632	367	173	None
Reduce or eliminate residential parking minimums and set moderate maximum levels - urban	"	30	801	660	383	181	None
Reduce or eliminate residential parking minimums and set moderate maximum levels - suburban	"	30	921	759	440	208	None
Unbundle residential parking[13]	Per 1,000 parking spaces rented for at least $100 per month in evaluation year	1	179	147	85	40	None
Additional tax or fee on public and/or private parking	Per 1,000 parking spaces per daily $1 fee in evaluation year	1	188	155	90	42	None

[12] Maximums: no more than1.0 (1 bed/studio/efficiency), 1.5 (2 bed), and 1.75 (3+ bed).

[13] This measure unbundles a residential project's parking costs from property costs, requiring those who wish to purchase parking spaces to do so at an additional cost. Unbundling may not be available to all residential developments, depending on funding sources.

Table IX-6 GHG Tons Estimate Calculation Methodologies - Land Use

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Increase residential density	Per acre rezoned from <10 units/acre to at least 15-25 units/acre meeting "smart growth" criteria	30	27	22	13	6	None
Increase job density	Per acre rezoned from <0.5 FAR to at least 1.0 FAR meeting "smart growth" criteria	30	22	18	11	5	None
Mixed-use Transit-Oriented Development (TOD) - higher intensity	Per acre of area rezoned for mixed-use TOD accommodating at least 25 residential units/acre and 150 jobs/acre, within 1/2 mile of fixed-guideway transit station	30	60	49	28	13	None
Mixed-use TOD - moderate intensity	Per acres of area rezoned for mixed-use TOD accommodating at least 15 residential units/acre and 100 jobs/acre, within ½ miles of high-frequency bus transit or fixed guideway station	30	49	40	23	11	None

Table IX-7 GHG Tons Estimate Calculation Methodologies - MD/HD[14]

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
Replace diesel transit buses with battery-electric buses	Number of new vehicles introduced between baseline	12	92	85	76	74	

[14] Strategies in this category will need to be recalibrated or reconsidered if an overlapping regulation is passed at the state level, such as the Advanced Clean Trucking rule.

Project Type	Unit	Project Lifetime (Years)	Tons/Unit Now – 2025	Tons/Unit 2026-2030	Tons/Unit 2031-2040	Tons/Unit 2041-2050	Additional Multipliers
	plan year 1 and evaluation year						
Replace diesel transit buses with hybrid diesel-electric buses	"	12	15	14	13	12	
Replace diesel transit buses with RNG bus	"	12	37	34	30	29	
Replace diesel school buses with electric buses	"	12	12	11	10	10	
Build medium duty truck charger	"	12	19	17	15	15	
Build heavy duty truck charger	"	12	32	30	27	27	
Replace medium duty truck	"	12	19	17	15	15	
Replace heavy duty truck	"	12	32	30	27	27	
Support hydrogen refueling infrastructure	"	12	45	250	420	420	Use 2040 values if hydrogen is produced from renewables

Clean Construction

Strategies in this category will be added in 2023.

XII. Calculation Methodologies

The GHG Mitigation Measure Calculation Methodology Workbook contains the inputs, assumptions, and calculation methodologies behind the estimated GHG savings for each project type.