Maryland Department of Transportation (MDOT)
Project Prioritization Technical Guide

Contents

1.0 Introduction

This guide outlines the Maryland Department of Transportation's (MDOT) new project prioritization process for evaluating surface transportation capacity enhancing projects requesting funding in the Consolidated Transportation Program (CTP). The new approach centers on data-driven, performance-based project evaluation that maximizes the value of Maryland's transportation investments and best achieves the State's values. It will first be implemented via a pilot round with no funding in 2025.

The new process builds on lessons learned from MDOT's existing prioritization system, Chapter 30. It also responds to directives from MDOT Secretary Paul Wiedefeld, who instructed MDOT to develop a new project prioritization process that will be used to evaluate surface transportation capacity enhancing projects, building upon efforts established by Chapter 30 and lessons learned. It also addresses recommendations from the Maryland Transportation Revenue and Investment Needs (TRAIN) Commission, established by Chapter 455 of the Acts of 2023.

1.1. Process Overview

MDOT is composed of five modal administrations -- the Maryland Aviation Administration (MAA); the Maryland Port Administration (MPA); the Motor Vehicle Administration (MVA); the State Highway Administration (SHA); the Maryland Transit Administration (MTA) – and authorities that are a part of MDOT, including the Maryland Transportation Authority (MDTA) and the Washington Metropolitan Area Transit Authority (WMATA). The Department's vision is to provide safe, reliable, accessible, equitable, and sustainable transportation options to Marylanders across the state.

To advance this vision, MDOT funds a wide range of transportation projects and services, including highways, transit systems, railroads, ports, aviation, and bicycle and pedestrian infrastructure, to support the mobility and economic vitality of the state. With the new prioritization process, MDOT will focus on capacity enhancing projects, aiming to improve the efficiency and performance of the state's surface transportation network by addressing congestion, accommodating growth, and fostering sustainable development. This shift ensures that investment decisions align with Maryland's goals for accessibility, economic competitiveness, and environmental stewardship.

The new prioritization process supports the selection of surface transportation capacity enhancing projects for the CTP, which provides a six-year capital budget for Maryland's transportation programs. Additional information about the CTP can be accessed via MDOT's website, here: mdot.maryland.gov/tso/pages/Index.aspx?PageId=27.

At a high level, the new prioritization process includes the following steps:

(1) MDOT determines and announces the amount of funding available for major surface transportation capacity enhancing projects in the upcoming round of prioritization.
(2) Eligible applicants submit projects to be considered for funding.
(3) MDOT reviews the project submissions and identifies those that are eligible to be evaluated for funding via the prioritization process.
(4) MDOT evaluates the eligible projects using a data-driven scoring approach and ranks the projects in descending order, with the highest-scoring project ranked first.
(5) MDOT compares the ranked projects' costs with the amount of funding available, provisionally identifying projects for funding by selecting the project with the highest rank first and moving down the list until the funding is exhausted.

(6) MDOT publishes the project ranks and list of projects selected for the Draft CTP for review and input during the fall CTP tour.
(7) The MDOT Secretary may adjust the list based on factors such as public input or geographic equity, if desired, and presents a final list to a public commission for review and further public discussion.

1.2 Process Objectives

The prioritization process is intended to:

- Make certain that new projects do the most they can to advance State's values
- Evaluate potential capacity enhancing projects using data-driven objective analysis to create a ranking of all potential new projects
- Be accessible, transparent and accountable
- Enable continuous public feedback and input to ensure the project prioritization objectives remain current and impactful

1.3 Stakeholder Input

Accessibility, transparency, and accountability are key objectives of the prioritization process. Documentation of the scoring approach is accessible through this document and via MDOT's website. Scoring materials are also shared online after each round of prioritization. MDOT welcomes feedback and comments on how to continue to improve the scoring process in subsequent rounds. Stakeholders can submit feedback and comments on the application process, evaluation methodology, project ranking, or any other part of the scoring model, by emailing prioritization@mdot.maryland.gov. MDOT takes all feedback into consideration during a review of the evaluation approach after each round.

2.0 Project & Applicant Eligibility

2.1 Who is eligible to submit projects for prioritization?

The following entities are eligible to propose projects to be scored:

- County
- Independent City
- Municipality
- State Government Agency
- Metropolitan Planning Organization (MPO)
- Locally Operated Transit Systems (LOTS)

All entities submitting project applications must have a brief, 1-2 sentence resolution or letter signed by their entity leadership, such as a governing body or executive. This is required to show official endorsement of the proposed project.[1]

2.2 What project types are eligible for prioritization?

To be eligible for prioritization, projects must 1) be surface transportation capacity enhancing projects for which the state funding request, including federal funding that MDOT controls, is at least $5 million and less than $400 million, 2) be located or operate on the state system or provide benefits to the state

[1] A template for the resolution or letter will be made available via the program website, available here: mdot.maryland.gov/tso/pages/Index.aspx?PageId=83.

system, and 3) have progressed far enough in their design work to provide the information necessary to for scoring.

2.2.1 What is a surface transportation capacity enhancing project? What isn't?

A surface transportation capacity enhancing project involves improvements to transportation infrastructure that increase its ability to handle more traffic or users. This can include widening roads, adding new travel lanes, building new transit lines, expanding rail capacity, or improving intersections and interchanges to reduce congestion and support increased mobility for vehicles, pedestrians, and transit users. These projects aim to accommodate growth, improve traffic flow, and enhance overall transportation efficiency.

Examples of eligible project types include:

Highway

- New roadway/bridge
- Widening a roadway/bridge, including auxiliary lanes, high-occupancy vehicle (HOV) lanes, and high-occupancy toll (HOT) lanes
- Interchange reconstruction that includes improvements beyond in-kind replacement and shoulder widening, such as ramp realignments, ramp widenings, auxiliary lanes, etc.
- Intersection improvements that involve more than in-kind replacement of assets
- New bike or pedestrian infrastructure
- ITS projects where the focus is improving throughput and capacity with physical infrastructure components
- Access management and innovative intersection improvements

Transit

- Light rail, heavy rail, and commuter rail projects (new routes, expansion of existing routes, and new stations)
- Bus rapid transit projects (new routes, expansion of existing routes, and new stations)
- New bus-only lanes
- New bus routes with infrastructure components
- Increases in bus service that requires capital purchases of buses
- Transportation demand management capital projects

Passenger Rail

- New tracks
- New stations

The following project types are eligible only if they result in capacity expansion: facilities upgrades, Complete Streets, Road Diet, and Transportation Demand Management (TDM) projects.

Examples of projects that are **not** eligible include:

- Projects being submitted to the Maryland Aviation Administration (MAA), the Maryland Port Administration (MPA), or the Maryland Transportation Authority (MDTA) portion of the CTP
- Maintenance and storage facilities projects
- Water quality improvement projects

- Projects related to Maryland's priorities for total maximum daily load development
- Safety-related projects that do not increase highway or transit capacity
- Roads within the Appalachian Development Highway System
- System preservation projects
- Transit station improvements required to meet federal requirements
- Bus and rail car procurement projects for in-kind replacement

2.2.2 What information is needed to submit a project for scoring?

To be scored, projects need to have a clearly defined scope that identifies the project alignment/area and the type of improvements that are included in the proposed project.[2] They must have: a) a draft feasibility study or an equivalent document to be published for public comment, b) a minimum level of design through the feasibility study or equivalent document, c) an identified alternative for projects subject to an alternatives analysis, and d) a reasonable and updated cost estimate.

For example, a highway widening project application would need to include the following information:

- Beginning and end point of project
- Description of proposed improvements at each intersection and/or interchange, such as turn lanes, ramp modifications, and traffic signal modifications
- Number of new through lanes and new auxiliary lanes
- Description of other changes, such as access management or ITS improvements

The applicant must provide MDOT with the source of the cost estimate and the year in which such estimate was developed. In no circumstance shall the estimate be more than 5-years old. MDOT reserves the right to update the cost estimate if they believe it is not accurate for the scope and timeline.

It is the responsibility of the proposing entity to ensure that these requirements are met. Projects that do not yet have a defined scope by the mid-February deadline are not eligible to be considered for funding through the prioritization process in the same fiscal year.

Requests for feasibility studies for future projects may be included in priority letters, which are submitted separately.

2.2.3 How many projects can an eligible entity propose?

All proposing entities have a cap on the number of applications they may submit per round. Except in the case of state agencies, this cap is structured in tiers based on the population served by the proposing entity and the project size (Table 2.1). For state agencies, the cap is structured in tiers based on project size only. These caps are reflective of the financial resources and capacity of MDOT to conduct the forecasting and project evaluation process and to evaluate only the highest priority needs of a proposing entity.

Table 2.1 Project Proposal Limits

Population of the Proposing Entity*	Projects with Costs** Over $20M	Projects with Costs** of $20M or Less	Total Projects

[2] Sample applications will be made available for prospective applicants' reference via the program website, available here: mdot.maryland.gov/tso/pages/Index.aspx?PageId=83.

Under 50,000	1 application	3 applications	4 applications
50,000- 500,000	2 applications	4 applications	6 applications
Over 500,000	4 applications	6 applications	10 applications
SHA/MTA/MDOT	6 applications	10 applications	16 applications

**For LOTS, population size is based on the population of the jurisdiction served.*

***State funding request, including federal funding that MDOT controls, for both capacity enhancing and SGR components*

3.0 Application Process

3.1 How often does MDOT conduct the project scoring process?

Project evaluation is conducted every other year, in Year 1 of a biennial implementation and evaluation cycle (Figure 3.1).

In Year 1 of this cycle, when MDOT is actively conducting project evaluation, MDOT announces the amount of funding available for prioritization prior to soliciting project proposals. An online application portal opens mid-January and closes in mid-February. Proposing entities use this time to compile and submit the necessary data for project scoring via the OneStop portal. In the weeks following the application deadline, MDOT processes applications, validates project information and eligibility, collects necessary technical data, and completes all modeling/forecasting and GIS analysis. In April, MDOT uses the modeling and GIS analysis results and technical data to evaluate each project, calculate the project scores, and determine the final ranking of projects. This ranking is completed by May 1.

In May, counties and independent cities submit priority letters to MDOT through a separate form via the OneStop portal. The MDOT Secretary will consider the priority letters and project rankings when finalizing the list of projects for the Draft CTP. The Draft CTP is made public in early September. The final project scores and rankings are included in an appendix in the Draft CTP and posted on the MDOT website.

Between September 15 and November 15, MDOT conducts CTP Tour meetings in all 23 counties and Baltimore City to solicit feedback from local partners on the Draft CTP and to discuss the project scores and ranking. Following the CTP Tours, the MDOT Secretary makes changes to the list of selected projects, if desired, based on factors such as public input or geographic equity. Details on the final scores and project rankings are provided in an appendix to the Final CTP and made available on the MDOT website.

In Year 2 of the biennial cycle, when MDOT is not actively conducting project evaluation, MDOT staff reviews the evaluation process. They conduct stakeholder engagement in July and August to solicit feedback on opportunities for improvement. In September, MDOT staff identify revisions to strengthen the prioritization process. They solicit public input on potential changes before finalizing and presenting recommendations in December.

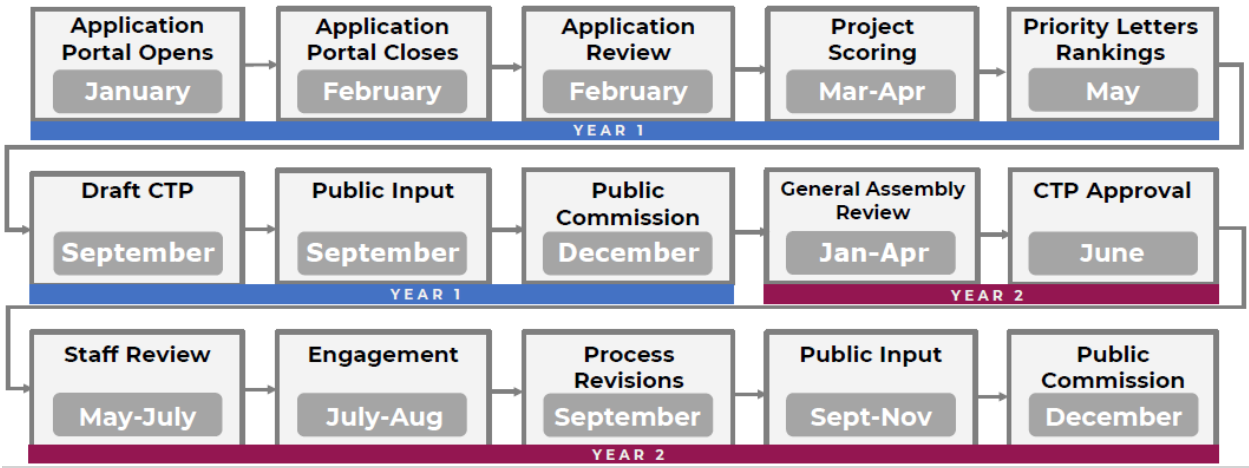

Figure 3.1 Biennial Scoring Cycle

3.2 How does an applicant submit a project for prioritization?

All applications must be submitted via the online OneStop portal. Incomplete applications are not considered. For the 2025 no-funding pilot, the application window will run from January 15 to February 18, 2025.

Prior to submitting an application, applicants may reach out to MDOT at prioritization@mdot.maryland.gov to engage in a preliminary discussion of the project and ensure that they are aware of the information needed to apply. This step is optional but highly encouraged.

Next, applicants should prepare and submit their project proposal via the application form in MDOT's OneStop portal.[3] When using the portal, applicants may begin submissions, save them, and return to complete them at a later date.

Project screening and scoring rely on a range of data sources. These are either provided by the proposing entity, in their application, or derived by MDOT based on the information provided. Table 2.2 describes the roles of the applicant and MDOT. Proposing entities are responsible for submitting the requested project data; MDOT is then responsible for conducting the modeling/forecasting and GIS analysis. Data and information submitted by the applicant is subject to verification by MDOT.

For each data element listed below, the OneStop portal provides guidance for satisfying the data requirement. Required supporting documentation includes a feasibility study or equivalent document, a detailed map of the project location and proposed improvements, and an endorsement letter from the leadership of the proposing entity.[4]

Table 2.2 Data Responsibilities

Item Description	Responsibility

[3] The OneStop portal is accessible here: onestop.md.gov/.
[4] A sample map and endorsement letter template will be made available via the program website, available here: mdot.maryland.gov/tso/pages/Index.aspx?PageId=83.

	MDOT	***Applicant***
Project Overview		
Project Purpose & Need Summary		X
Modal/Facility Type		X
Scope Type		X
Project Cost Estimate & Funding Request		X
Project Area	X	
Project Location		
County (or Counties)		X
Project Limits		X
In-Kind Replacement Cost for State of Good Repair (SGR) Components		X
Identification Numbers for Included Bridges for SGR Components		X
Five-year Vehicle Miles Traveled (VMT)	X	
Percent Overlap with Disadvantaged Community	X	
Percent Truck Annual Average Daily Traffic (AADT)	X	
Overlap with Non-Attainment and/or Maintenance Areas*	X	
Five-year Crash Data	X	
Project Scope		
Proposed Improvement Types & Locations		X
Length of Proposed Bike Lane		X
Length of Proposed Sidewalk		X
Number of Lanes (Existing and Proposed)		X
Transit Stops (Start, End, and Intermediary)		X
Alignment		X
Travel Time/Run Time		X

Span of Service		X
Frequency		X
Population Density and Cyclist Commute Share	X	
Safety Improvement Types and Locations**		X
Travel Demand		
Daily Travel Time Reduction	X	
Annual Fuel Savings	X	
New Weekday Transit Passengers***		X
Accessibility		
Change in Job Accessibility	X	
Change in Jobs Accessibility for Disadvantaged Populations	X	
Average Walk Score	X	
Pedestrian Accessibility Improvement		X
Economic Competitiveness & Land Use		
Potential Land Value Uplift	X	
Anticipated Change in Population (2025-2045)	X	
Anticipated Change in Employment (2025-2045)	X	

**Relevant non-attainment and maintenance areas include: SOX NAAQS Area for Anne Arundel County & Baltimore County, CO NAAQS Area for Baltimore City, and CO NAAQS Area for Washington, DC.*

***Safety improvement types include: widened shoulder; dedicated turn lanes; rumble strips; improved road alignment; guardrail, median, buffers; new lighting; pedestrian facilities; bicycle facilities; and 'other.'*

****Future feasibility study guidance will outline the appropriate steps for a project sponsor to take to determine this estimate.*

3.3 Should projects previously submitted for scoring under the Ch. 30 model be resubmitted?

Project sponsors do not need to submit a full application under the new prioritization approach for projects previously scored under Chapter 30. They are required, however, to inform MDOT that they want the project scored under Chapter 30 to be considered for the new prioritization program and provide any additional information required to score the project under the new approach.

Project sponsors should reach out to MDOT at prioritization@mdot.maryland.gov to request that a project previously scored via Chapter 30 be considered. For the 2025 no-funding prioritization pilot, the deadline for these requests is Friday, January 31.

4.0 Project Evaluation

4.1 What happens after an application is submitted?

After the application deadline, MDOT reviews the submitted projects to confirm they meet the process' eligibility requirements. Staff also validate the information provided via the application before assembling a final list of eligible candidates ready for the scoring process. MDOT confirms the scope of each project slated for scoring with the applicant prior to beginning the evaluation process.

4.2 How will projects be evaluated, and by whom?

All eligible surface transportation projects, regardless of location or type, are evaluated based on their contributions to –

- Safety
- Accessibility and Mobility
- Climate Change and the Environment
- Social Equity
- Economic Competitiveness
- Sustainable Land Use/Demand Management

There are 11 measures against which projects are evaluated to quantify their contributions toward these goal areas. Measure development was supported by a Project Prioritization Workgroup composed of SHA, MTA, and TSO staff members. Measures were developed based on the following criteria.

Measures should be –

- Rooted in the State Plan
- Quantitative
- Outcome-based
- Tied to the key inputs informing the target outcome
- Evaluating outcomes as directly as possible

The measures are listed below by goal area. The full methodology for calculating each measure is available in Appendix A.

Safety Measures

There are two measures that evaluate how a project improves safety through design improvements, safer infrastructure, and targeted interventions (Table 4.1).

Table 4.1 Safety Measures

#	Description
1	Reduction in fatalities and serious injuries (F&SI)

2	Reduction in F&SI per 100 Vehicle Miles Traveled (VMT)*

**Applies only to projects with roadway components.*

Accessibility & Mobility Measures

There are two measures that evaluate how a project addresses improving accessibility and mobility (Table 4.2).

Table 4.2 Accessibility & Mobility Measures

#	Description
3	Increased access to jobs
4	Increase in Non-single Occupancy Vehicle (Non-SOV) trips

Climate Change & the Environment Measures

There are two measures that evaluate how a project addresses climate change and the environment (Table 4.3).

Table 4.3 Climate Change & the Environment Measures

#	Description
5	Reduction in greenhouse gas (GHG) emissions
6	Reduction in criteria pollutants

Social Equity Measures

There are two measures that evaluate how a project addresses social equity (Table 4.4).

Table 4.4 Social Equity Measures

#	Description
7	Improvement to job access for disadvantaged communities
8	Safety impact in disadvantaged communities

Economic Competitiveness Measures

There are two measures that evaluate how a project addresses economic competitiveness (Table 4.5).

Table 4.5 Economic Competitiveness Measures

#	Description
9	Reduction person hours of delay
10	Increase in land productivity

Sustainable Land Use/Demand Management Measures
There is one measure that evaluates how a project addresses sustainable land use/demand management (Table 4.6).

Table 4.6 Sustainable Land Use/Demand Management Measure

#	Description
11	Support for sustainable land use

MDOT evaluates projects using a combination of data provided in project applications and additional derived data. Each project is scored based on each of the 11 measures outlined above, with scores ranging from 0 to 100. The top-performing project for each measure receives a score of 100, and all other projects are scored proportionally relative to the top score. The scoring process involves applying weights to the evaluation measures and goal areas. The weighted scores are then summed to calculate the total project score.

For example, for Measure #5 (Reduction in greenhouse gas emissions), Project A achieves the highest reduction, 20,000 metric tons of CO_2, and is awarded a score of 100. Project B, which does not reduce emissions, receives a score of 0. Project C, with an estimated reduction of 10,000 metric tons of CO_2 (half of Project A's performance), earns a score of 50. This scoring method is repeated for all 11 measures. Each measure score is multiplied by its respective weight to determine a weighted score. The weighted scores within each goal area are summed to produce a goal area score. Finally, the goal area scores are multiplied by their respective goal area weights, and the resulting values are summed to calculate the total project score.

4.3 How are the final Score-Cost Ratio (SCRs) and ranks calculated?

To account for cost-effectiveness, the total project score is divided by the state funding request, including federal funding that MDOT controls, to calculate the final Score-Cost Ratio (SCR). Projects are ranked based on their SCR. Dividing the total project score by the project cost shows a project's relative value and ensures that its financial feasibility is considered in the prioritization process. Projects with higher SCRs are determined or expected to deliver the most benefit for the lowest cost. Given this approach, if two projects have the same score, then the less costly of the two projects will have a superior ranking.

5.0 Prioritization & Programming

5.1 How are the scoring process results used in project selection?

Determining project scores and rankings is the first step in a three-step process outlined below.

5.1.1 Preliminary List of Funded Projects

First, as described above, projects are evaluated based on 11 measures across six goal areas and ranked based on the scoring results.

5.1.2 Draft Consolidated Transportation Program (CTP) & CTP Tour

Second, project rankings and the list of projects selected for funding in the Draft CTP are published for public review and input during the fall CTP Tour. They are included in an appendix in the Draft CTP and posted on the MDOT website. Between September 15 and November 15, MDOT conducts CTP Tour meetings in all 23 counties and Baltimore City to solicit feedback from local partners on the Draft CTP and to discuss the project scores and ranking.

5.1.3 Final List of Funded Projects

Third, the MDOT Secretary makes changes to the list of selected projects, if desired, based on factors such as public input or geographic equity, and presents a final list to a public commission at a public meeting for review and further discussion. Details on the final scores and project rankings are provided in an appendix to the Final CTP and made available on the MDOT website. Projects will be fully programmed through construction in the CTP when selected through the prioritization process.

6.0 Public Input & Feedback

6.1 How can stakeholders participate in the prioritization process?

The prioritization process will include the following transparency provisions:

- Public feedback and local priorities will be considered as a post-evaluation factor during the Final CTP decision-making process.
- MDOT will publish applications online.
- MDOT will solicit public comment on projects during the Draft CTP review.
- MDOT will solicit local priority letters to understand local government priorities. The letters will not influence the quantitative evaluation of projects but will be considered by the Secretary and MDOT during the CTP development process. Proposing entities may submit priority letters via a standalone form in the OneStop portal in May.

6.2 How can stakeholders provide feedback on the new process?

MDOT is committed to continually evaluating the prioritization process to ensure it is the most effective, transparent, and fair methodology for evaluating projects. MDOT will conduct an evaluation of the prioritization process every other year, alternating active scoring years with those dedicated to assessment of the approach's goal areas, measures, and mechanics. These evaluations will include structured solicitation of stakeholder feedback and input; however, stakeholder feedback is not limited to these windows and is welcome at any time. Suggestions for ways to strengthen the scoring model may be submitted via email, at prioritization@mdot.maryland.gov.

Appendix A. Measure Calculations

Safety

Table A.1 Safety – Measures Summary

#	Description
1	Reduction in fatalities and serious injuries (F&SI)
2	Reduction in F&SI per 100 Vehicle Miles Traveled (VMT)

Measure #1: Reduction in fatalities and serious injuries (F&SI)

Description:
This measure quantifies the extent to which the proposed improvements are anticipated to reduce fatalities and serious injuries (F&SI). The process for calculating the measure includes adjustments for roadway safety improvements and new transit ridership.

For roadway improvements, safety benefits are estimated based on the specific safety improvements planned for the project. For each type of safety improvement, a Crash Reduction Factor (CRF) is specified by type of crash based on the Federal Highway Administration (FHWA) Crash Modification Factor (CMF) Clearinghouse.[5] Overall CRFs are established for each type of crash by combining the CRFs for the different safety improvements. These CRFs are applied to the actual numbers of F&SI recorded at the project location over the past five years to calculate a predicted, five-year reduction in F&SI.

For transit improvements, safety benefits are calculated by estimating the reduction in Vehicle Miles Traveled (VMT) resulting from new passengers shifting away from Single Occupancy Vehicles (SOVs). The VMT reduction is multiplied by state average rates for F&SI to determine the predicted five-year reduction in F&SI resulting from a shift from SOVs to transit.

Applicant Data Needs:
- Project limits
- Mode
- Safety improvement types and locations
- New weekday transit passengers

MDOT Data Inputs:
- Five-year crash data for the project location
- Estimated F&SI reduced per passenger (state average)

External Data Inputs/Parameters:
- CRFs (FHWA CMF Clearinghouse)

[5] U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA), "Crash Modification Factors Clearinghouse," https://cmfclearinghouse.fhwa.dot.gov/.

Methodology:

Roadway Improvements

1. Establish the project's location and proposed safety improvements.
2. Identify F&SI crashes in the project location for the most recent five years for which data is available, specifying the number of F&SI, type, and location for each crash.
3. Calculate CRFs by crash type
4. For each location and crash type, multiply the numbers of F&SI by the corresponding CRF to calculate the predicted five-year reduction in F&SI. Fatalities and serious injuries are weighted equally and combined in this step.
5. Sum the reductions in F&SI for all locations and crash types.

For example, a highway project includes the following safety improvements: widen shoulder; install rumble strips; install guardrail, median, and/or buffers; install lighting; and construct bicycle facilities. Within the most recent five years for which crash data is available, there have been six fatalities and 99 serious injuries at the project location.

Based on the FHWA CMF Clearinghouse, MDOT compares the types of crashes for each of these incidents to the proposed safety improvements, identifying instances where the proposed improvements would be anticipated to reduce the types of crashes that have occurred at the project location. MDOT assigns average CRFs, or multipliers, as estimates of the factor by which the improvements would reduce their associated crash types.

The project's shoulder widening improvement, for instance, would be anticipated to reduce the number of Fixed Object, Head-On, Run Off Road, and Sideswipe crashes by a factor of 0.93. There have been –

- 1 recent fatality and 12 recent serious injuries associated with Fixed Object crashes,
- 2 recent serious injuries associated with Head-On crashes,
- No fatalities or serious injuries associated with Run-Off Road crashes, and
- 2 recent serious injuries associated with Sideswipe crashes.

The shoulder widening improvement, alone, would be anticipated to reduce the number of serious injuries by 2.72 over the next five years. These includes a reduction of those associated with –

- Fixed Object crashes by 2.04 (12 x (1-.93)),
- Head-On crashes by 0.34 (2 x (1-.93)), and
- Sideswipe crashes by 0.34 (2 x (1-.93).

There is no potential for reduction associated with Run-Off Road crashes (0 x (1-.93)).

MDOT conducts this process for each safety and improvement type combination for fatalities and serious injuries combined. It finds that the project, in total, is anticipated to reduce 32.3 fatalities and serious injuries over the subsequent five years. This is the value on which its Measure #1 score is based, with fatalities and serious injuries weighted equally.

Transit

1. Establish the estimated number of new transit passengers.
2. Multiply the estimated number of new passengers by derived constants to calculate the associated anticipated reduction in VMT.

3. Multiply the anticipated reduction in VMT by state average rates for F&SI to determine the anticipated reduction in F&SI.

Measure #2: Reduction in fatalities and serious injuries (F&SI) per 100M Vehicle Miles Traveled (VMT)

Description:
This measure applies only to projects with roadway components. For transit projects without roadway components, the measure is not calculated, and the project's score for the safety goal area is composed entirely of its Measure #1 score. This measure converts the project's anticipated five-year reduction in F&SI into a rate. It is calculated by dividing the project's anticipated five-year reduction in F&SI by the five-year VMT for the project location. As with Measure #1, fatalities and serious injuries are weighted equally.

Applicant Data Needs:
- Project limits
- Mode
- Safety improvement types and locations

MDOT Data Inputs:
- Five-year crash data for the project location
- Five-year VMT for the project location

External Data Inputs/Parameters:
- CRFs (FHWA CMF Clearinghouse)

Methodology:
1. Establish the project's location and mode(s).
2. Establish the project's anticipated five-year reduction in F&SI. *(Note: This is the output of Measure #1: Reduction in F&SI.)*
3. Identify the five-year VMT for the project location.
4. Divide the anticipated reduction in F&SI by the VMT to determine the reduction in F&SI per 100M VMT.

Accessibility & Mobility

Table A.2 Accessibility & Mobility – Measures Summary

#	Description
3	Increase in access to jobs
4	Increase in Non-single Occupancy Vehicle (non-SOV) trips

Measure #3: Increase in access to jobs

Description:
This measure quantifies the extent to which the proposed project is predicted to increase access to jobs. It uses outputs from two modeling/forecasting tools, the Multi-Modal Accessibility Tool and the

Maryland Statewide Transportation Model (MSTM), to develop the number of jobs accessible in both the build scenario, with the proposed project, and the no-build scenario, without the proposed project. As a part of this analysis, jobs that can be reached in less time are given greater weight than jobs that are require more time to reach. The measure does not detail the total number of jobs accessible, but rather the increase in the number of jobs associated with the mobility benefits related to the improved access that the project may provide.

Applicant Data Needs:

- Project limits
- Mode
- Proposed improvements

MDOT Data Inputs:

- Employment information at a neighborhood level[6]
- Highway and transit travel times (baseline or no-build condition)
- Highway and transit travel times (build condition)

External Data Inputs/Parameters:

- N/A

Methodology:

1. Identify zones that comprise the study area for each project.
2. Use the MSTM multi-resolution framework to assign traffic at the higher-resolution (Level2) zone structure.
3. Use the MSTM combined with the Accessibility Tool to develop the current (no build) number of jobs accessible, using a decay curve.
4. Using the same approach, calculate the number of jobs accessible for the build scenario.
5. Subtract projected number of accessible jobs from current number.

Measure #4: Increase in non-Single Occupancy Vehicle (non-SOV) trips

Description:
This measure quantifies the extent to which a project is predicted to increase non-SOV trips. It sums the number of anticipated new transit trips, provided by the applicant, and the predicted number of new cyclists, derived using a methodology specified in National Cooperative Highway Research Program (NCHRP) Report 552, "*Guidelines for Analysis of Investments in Bicycle Facilities*."[7]

Applicant Data Needs:

- Project limits
- New weekday transit passengers
- Length of proposed bike lane

MDOT Data Inputs:

[6] In this context, neighborhoods are defined by Statewide Model Zones (SMZs).
[7] Kevin J. Krizek et. al, *NCRHRP Report 522: Guidelines for Analysis of Investments in Bicycle Facilities*, Transportation Research Board of the National Academies, Washington, D.C., 2006, https://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_552.pdf.

- Population density and cyclist commute share within a ¼-mile, ½-mile, and 1-mile of the proposed bike lane (U.S. Census Bureau)

External Data Inputs/Parameters:

- NCRHP Report 552 constants for predicting cycling demand

Methodology:

1. Establish the project's location, estimated new transit passengers, and length of proposed bike lane, as applicable.
2. Determine the population density and cyclist commute share within a ¼-mile, ½-mile, and 1-mile radius of the project.
3. Use the NCHRP Report 552 methodology to estimate the increase in cyclists.
4. Sum the new transit trips and new cyclists estimates to obtain an estimated increase in non-SOV trips.

Climate Change & the Environment

Table A.3 Climate Change & the Environment Measure Calculations – Measures Summary

#	Description
5	Reduction in greenhouse gas (GHG) emissions
6	Reduction in criteria pollutants

Measure #5: Reduction in greenhouse gas (GHG) emissions

Description:

This measure quantifies the extent to which a project is predicted to reduce greenhouse gas emissions (GHG). Its calculation relies, first, on determining the project's anticipated fuel savings, calculated by combining outputs from the MSTM and a derived estimate for additional fuel savings due to new transit trips. Each gallon of gasoline saved is estimated reduce CO2 emissions by 8.10 kg and each gallon of diesel reduced is estimated to reduce CO2 emissions 10.19 kg. Based on the assumption that 98% of fuel used by autos is gasoline and 2% is diesel, reducing a gallon of fuel for autos reduces CO2 emissions by 8.15 kg. Likewise, based on the assumption that 19% of fuel used by trucks is gasoline and 81% is diesel, reducing a gallon of fuel for trucks reduces CO2 emissions by 9.78 kg.

Applicant Data Needs:

- Project limits
- Mode
- Proposed improvements
- New weekday transit passengers

MDOT Data Inputs:

- Annual fuel savings for highway elements (gallons)
- Percent of Average Annual Daily Traffic (AADT) composed of trucks for the project location
- Five-year VMT for project location

External Data Inputs/Parameters:

- CO_2 emissions (kg/gallon) (FHWA)
- Percent of autos fueled by gas and diesel (AASHTO GHG Calculator)
- Percent of trucks fueled by gas and diesel (AASHTO GHG Calculator)
- VMT per transit trip
- Average fuel efficiency (mpg)
- Fuel consumed by additional million VMT (kgal/year) (derived)
- Fuel saved per transit passenger (kgal/year) (derived)
- Elasticity assumptions (Rocky Mountain Institute (RMI) SHIFT Calculator)[8]

Methodology:

Part 1

Highway

1. Identify zones that comprise the study area for each project.
2. Use the MSTM multi-resolution framework to assign traffic at the higher-resolution (Level2) zone structure.
3. Calculate the daily fuel consumption from each period based on congested travel times for the baseline or no-build condition within the study area.
4. Calculate the daily fuel consumption from each period based on congested travel times for the build condition within the study area.
5. Subtract the daily fuel consumed under the no-build condition from the build condition to estimate daily fuel savings due to improvements in operating speeds.
6. Annualize fuel savings.
7. Divide by 1,000 to convert value into 1,000s of gallons.
8. Calculate the predicted annual increase in millions of VMT.
9. Multiply the annual increase in millions of VMT by the annual increase in fuel in kcal/year (constant).
10. Subtract this value from the predicted fuel savings. *(Note: Projects with negative values will receive an outcome of 0.)*

Transit

1. Obtain the estimate of daily new transit passengers.
2. Calculate the reduced fuel consumption as a result of new transit riders by:
    a. Converting new daily transit passengers to annual passengers.
    b. Multiplying by average transit trip length in miles (constant)
    c. Dividing by Fuel Economy Average in miles per gallon (constant)
    d. Dividing by 1000 to convert value into 1000s of gallons.

Multi-Modal

1. Conduct Part 1 - Highway and Part 1 - Multi-Modal
2. Sum the values for fuel savings estimates for highway and transit.

[8] Rocky Mountain Institute (RMI), State Highway Induced Frequency of Travel (SHIFT) Calculator, 2021, https://shift.rmi.org/.

Part 2

All Project Types

1. Establish the percent of AADT composed of trucks for the project location.
2. Estimate the predicted reduction in gasoline and diesel consumption using established constants from the AASHTO GHG Calculator for fuel type and efficiency for autos and trucks.[9]
3. Multiply the predicted reduction in gasoline and diesel consumption by constants for CO2 content of gasoline and diesel specified by FHWA.
4. Sum the CO_2 reduction from reduced gasoline and diesel consumption to obtain an overall annual reduction in CO_2 (metric tons).

Measure #6: Reduction in criteria pollutants

Description:

This measure quantifies the extent to which a project is predicted to reduce criteria pollutants. The measure's calculation relies, first, on determining whether a project is located in an Environmental Protection Agency (EPA) non-attainment or maintenance area. Maryland contains nonattainment or maintenance areas for pollutants including Nitrogen Oxide (NO_x), Volatile organic compounds (VOCs), Particulate Matter 2.5 (PM-2.5), Sulfur Dioxide (SO_x), and Carbon Monoxide (CO). For projects that overlap with these areas, the project's anticipated reduction in fuel consumption (*calculated for Measure #5: Reduction in GHG emissions*) is multiplied by established constants to determine reductions for the relevant pollutants. These are then converted to monetary equivalents using established constants to obtain an overall dollar value for the weighted reduction in criteria pollutants.

Applicant Data Needs:

- Project limits
- Mode
- Proposed improvements
- New weekday transit passengers

MDOT Data Inputs:

- Annual fuel savings for highway elements (gallons)
- Percent of AADT composed of trucks for the project location
- Five-year VMT for project location
- Overlap with non-attainment and/or maintenance areas

External Data Inputs/Parameters:

- VMT per transit trip
- Average fuel efficiency (mpg)
- Fuel consumed by additional million VMT (kgal/year) (derived)
- Fuel saved per transit passenger (kgal/year) (derived)

[9] American Association of State Highway and Transportation Officials (AASHTO) Transportation Performance Management Portal, Transportation GHG Calculator, n.d., https://www.tpm-portal.com/tool/ghg-performance-calculator/.

- Elasticity assumptions (RMI SHIFT Calculator)[10]
- Limits of non-attainment and maintenance areas (EPA)
- Auto and truck emissions rates by pollutant (kg/gallon at 25 mph) (CAL-B/C)
- Emissions cost ($/mton) CAL-B/C)

Methodology:

1. Obtain the project's anticipated reduction in fuel consumption (*calculated for Measure #5: Reduction in GHG emissions).*
2. Determine whether the project falls in a non-attainment or maintenance area for each of the five identified pollutants (NO_x, VOC, PM-2.5, SO_x, CO).
3. Determine the anticipated reduction in for each pollutant using established constants.
4. Calculate a combined dollar equivalent for weighted reduction in criteria pollutants using an established constant.

Social Equity

Table A.4 Social Equity Measure Calculations – Measures Summary

#	Description
7	Improvement to Job Access for Disadvantaged Communities
8	Safety Impact in Disadvantaged Communities

Measure #7: Improvement to job access for disadvantaged communities

Description:
This measure quantifies the anticipated change in number of jobs accessible to disadvantaged communities associated with the project. It is calculated using the same approach to Measure #3: Increase in Access to Jobs, with the analysis geographically restricted to identified disadvantaged communities. In this context, disadvantaged communities are identified at the Census Tract level using the Climate Solutions Now Act's (CSNA's) (2022) definitions of overburdened and underserved communities.

Applicant Data Needs:

- Project limits
- Mode
- Proposed improvements

MDOT Data Inputs:

- Employment information at a neighborhood level[11]
- Highway and transit travel times (baseline or no-build condition)
- Highway and transit travel times (build condition)

[10] Rocky Mountain Institute (RMI), State Highway Induced Frequency of Travel (SHIFT) Calculator, 2021, https://shift.rmi.org/.
[11] In this context, neighborhoods are defined by Statewide Model Zones (SMZs).

External Data Inputs/Parameters:

- Disadvantaged community locations

Methodology:

1. Using geospatial modelling tools, calculate the current (no build) number of jobs accessible for disadvantaged populations only, using a decay curve.
2. Calculate the number of jobs accessible for the build scenario, again for disadvantaged populations only, using a decay curve.
3. Subtract projected number of accessible jobs from current number.

Measure #8: Safety impact in disadvantaged communities

Description:

This measure quantifies how the project is predicted to reduce F&SI for disadvantaged communities. It is calculated by scaling the project's overall anticipated reduction in F&SI *(calculated for Measure #1: Reduction in F&SI)* by its overlap with disadvantaged communities. In this context, disadvantaged communities are identified at the Census Tract level using the Climate Solutions Now Act's (CSNA's) (2022) definitions of overburdened and underserved communities. As with Measure #1, fatalities and serious injuries are weighted equally.

Applicant Data Needs:

- Project limits
- Mode
- Safety improvement types and locations
- New weekday transit passengers

MDOT Data Inputs:

- Five-year crash data for project location
- Estimated F&SI reduced per passenger (state average)
- Disadvantaged community locations
- Percent project area overlap with disadvantaged communities

External Data Inputs/Parameters:

- CRF (FHWA CMF Clearinghouse)
- Disadvantaged community locations

Methodology:

1. Establish the project's location and overall anticipated five-year reduction in F&SI. *(Note: This is output of Measure #1: Reduction in F&SI.)*
2. Calculate the project area's percent overlap with disadvantaged communities.
3. Multiply the percent overlap by overall anticipated five-year reduction in F&SI to estimate a representative reduction in F&SI in disadvantaged communities.

Economic Competitiveness

Table A.5 Economic Competitiveness Measure Calculations – Measures Summary

#	Description
9	Reduction Person Hours of Delay
10	Increase in Land Productivity

Measure #9: Reduction person hours of delay

Description:
This measure quantifies the extent to which a project is predicted to reduce travel time delay. For projects with transit components, it incorporates reductions in delay predicted as a direct result of the project and additional indirect delay reduction from new transit trips, which are assumed to reduce VMT by replacing SOV trips with non-SOV trips, in turn reducing congestion.

Applicant Data Needs:
- Project limits
- New weekday transit passengers
- Proposed improvements
- Mode

MDOT Data Inputs:
- Daily uncongested highway travel times
- Daily congested highway travel times
- Transit travel time savings

External Data Inputs/Parameters:
- Highway delay reduction per transit trip (min) constant (Parry & Small, 2009)[12]

Methodology:

<u>Highway</u>
1. Identify zones that comprise the study area for each project.
2. Use the MSTM multi-resolution framework to assign traffic at the higher-resolution (Level2) zone structure for the current conditions.
3. Combine the vehicle hours travelled (VHT) for each time-of-day to develop daily VHT based on travel time at the posted speed limit.
4. Combine the vehicle hours travelled for each time-of-day to develop daily VHT under congested conditions.
5. Subtract the congested VHT from the VHT to calculate the vehicle hours of delay (VHD).
6. Annualize the daily VHT and convert VHT to person hours of travel based on assumed vehicle occupancy.

[12] I. W. H. Parry and K.A. Small, Should urban transit subsidies be reduced?, *American Economic Review*, *99*(3), 2009, 700-724, https://www.aeaweb.org/articles?id=10.1257/aer.99.3.700.

Transit

1. Obtain the number of daily new transit passengers.
2. Calculate the travel time savings for transit users through the Multi-Modal Accessibility tool.
3. Compute a comparison of the matrix of zone-to-zone transit travel time savings against the highway trip table from the MSTM to compute a weighted average of travel time savings, multiplied by transit ridership and annualized.
4. Compute travel time savings for highway users as a result of the transit project.
    a) multiply daily new transit passengers by the travel time savings for new transit passenger (constant value expressed in minutes/trip).
    b) Convert from daily to annual travel time savings.
    c) Divide by 60 to convert minutes of travel time savings to hours of travel time savings.
    d) Divide by 1000 to convert value to align with the 1000s of hours scale.

Multi-Modal

1. Conduct the highway analysis outlined above.
2. Conduct the transit analysis outlined above.
3. Add the values for annual travel time savings for highway and transit users.

Measure #10: Increase in land productivity

Description:
This measure quantifies the extent to which a project is predicted to contribute to an increase in land value around the project area. For each parcel within a ¼ mile of the project, the potential increase in property value of the parcel (dollars/acre) is calculated as the difference between the 75th percentile of the value for that zoning category and the existing value. For projects introducing new service, it is assumed that the project will help achieve up to 75% of this potential uplift, while for expansion projects, it is assumed that the project will help achieve 10% of this potential increase. The measure is calculated as the sum of this scaled potential uplift values for all parcels within a ¼ mile of the project.

Applicant Data Needs:

- Project limits
- Project type (expansion, new service, or other)

MDOT Data Inputs:

- Parcel data (zoning, land use, and assessed value)

External Data Inputs/Parameters:

- Project type uplift coefficients

Methodology:

1. Establish project location and type.
2. Obtain data on zoning, assessed value, and land area data for parcels within 1/4-mile buffer of the project location
3. Identify the 75th percentile of assessed value for parcels within the buffer for each zoning category
4. For each parcel, calculate the potential uplift in value as the difference between the 75th percentile in value for its zoning category multiplied by its land area and current assessed value

5. Sum the potential parcel uplift values
6. Apply an uplift coefficient to the aggregate potential increase in land value to determine the predicted uplift for the project. The uplift coefficient for new projects is 75%; the uplift coefficient for expansion projects is 10%.

Sustainable Land Use/Demand Management

Table A.6 Sustainable Land Use/Demand Management Measure Calculations – Measures Summary

#	Description
11	Support for sustainable land use

Measure #11: Support for sustainable land use

Description:
This measure quantifies the extent to which a project helps support planned new growth where the form and location results in a reduced impact on the transportation network. The measures examines where the location of the project has characteristics that have been demonstrated to result in lower levels of vehicle miles traveled, through accessibility to non-work destinations, and considers the amount of new population and employment planned for the area.

Applicant Data Needs:
- Project limits
- Pedestrian accessibility improvement

MDOT Data Inputs:
- Employment and population projections at the neighborhood
- Neighborhoods overlapping with the project location, total size of overlapping neighborhoods (acres), and size of overlapping portion (acres)[13]
- Zip codes intersecting with the project location

External Data Inputs/Parameters:
- Walk Score[14]

Methodology:
- Obtain and average the Walk Scores for zip codes intersecting with the project location.
- Identify the neighborhoods that overlap with the project location, the total size of each overlapping neighborhoods (acres), and the size of the overlapping portion (acres).
- For each overlapping neighborhood, calculate:
    - the share of the neighborhood that overlaps,
    - the projected change in employment (2025-2045), and
    - the projected change in population (2025-2045).

[13] In this context, neighborhoods are defined by Statewide Model Zones (SMZs).
[14] Walk Score, "About Walk Score," n.d., https://www.walkscore.com/.

- Multiply the percent overlap by the projected change in employment and projected change in population for each overlapping neighborhood and sum.
- Combine the projected growth in population and employment.
- Multiply by the average Walk Score for the project location.