



**SMART  
SCALE**

*Funding the Right  
Transportation Projects  
in Virginia*

# SMART SCALE Technical Guide

*prepared for*

Commonwealth Transportation Board

*date*

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# 1.0 Introduction

Transportation needs will almost always be greater than the funds available to address them. The signing of House Bill 2313 in 2013 created a more sustainable revenue source supporting transportation funding. While passage of this bill enabled the Commonwealth Transportation Board (CTB) to add approximately \$4 billion in funding to the six-year improvement program, there are still many transportation needs that cannot be addressed with available revenues. To find a way to better balance transportation needs and prioritize investments for both urban and rural communities throughout the Commonwealth, new legislation – House Bill 2 – was signed into law in 2014. In 2016, the process was renamed “SMART SCALE, Funding the Right Transportation Projects in Virginia.” SMART SCALE stands for System Management and Allocation of Resources for Transportation.

The purpose of SMART SCALE is to fund the right transportation projects through a prioritization process that evaluates each project’s merits using key factors, including: improvements to safety, congestion reduction, accessibility, land use, economic development and the environment. Prior to the implementation of SMART SCALE, the Commonwealth utilized a politically driven and opaque transportation funding process that included uncertainty for local communities and businesses. SMART SCALE requires the CTB to develop and implement a quantifiable and transparent prioritization process for making funding decisions for capacity enhancing projects within the six-year improvement program.

The ultimate goal in the implementation of SMART SCALE is investing limited tax dollars in the right projects that meet the most critical transportation needs in Virginia. Transparency and accountability are crucial aspects of delivering a process that project sponsors will support. SMART SCALE projects will be evaluated based on a uniform set of measures that are applicable statewide, while recognizing that factors should be valued differently based on regional priorities.

The SMART SCALE implementation process starts in July of even numbered years, with projects initially selected by the CTB for inclusion in the draft Six-Year Improvement Program (SYIP) by Spring. The SMART SCALE process does not cover all types of projects within the SYIP. There are other sources of funding including maintenance and rehabilitation, safety, operations, and other Federal and Commonwealth funding categories detailed later in this guidance document.

The first round of SMART SCALE prioritization was successfully completed in the first half of 2016. Throughout the initial SMART SCALE process, information was collected on lessons learned in order to identify potential improvements to



the application in-take, screening, validation evaluation process, documentation and training. This updated Technical Guide reflects these recent improvements.

This Technical Guide document provides detailed information on the CTB's SMART SCALE policy including information on process, roles and responsibilities, project eligibility, the project application process, evaluation measure definitions, project cost and scoring, and prioritization and programming considerations and rules.

## 1.1 SMART SCALE LEGISLATION REQUIREMENTS

Virginia House Bill 2, signed by Governor Terry McAuliffe on April 6, 2014 and effective as of July 1, 2014, (as defined in § 33.2-214.1) required the development of a prioritization process and directed the CTB to develop and use a scoring process for project selection by July 2016. The prioritization process evaluates projects using following factor areas: congestion mitigation, economic development, accessibility, safety, environmental quality and land use coordination (in areas with over 200,000 population). Factor areas are weighted differently across the commonwealth based on certain characteristics and may be weighted differently within each district. Candidate projects are screened to determine if they meet an identified need in VTrans, the Commonwealth's long range transportation plan.

Projects are scored based on an objective and fair analysis applied statewide. SMART SCALE also requires project benefits be analyzed relative to project cost. The Secretary of Transportation and CTB make the evaluation process and results available to the public, so that the public knows how each project is scored and the rationale behind the CTB's project selections.

### Funding Programs

In February 2015, the General Assembly approved HB1887, which established a new transportation funding formula, specifically the State of Good Repair Program (SGR), High-Priority Projects Program (HPPP), and District Grant Program (DGP). Both the HPPP and the DGP are subject to SMART SCALE (see table 1.1).

The HPPP (as defined in § 33.2-370) refers to projects of regional or statewide significance that address a transportation need identified for a corridor of statewide significance or a regional network in VTrans2040, the Statewide Transportation Plan. In this program, projects and strategies compete for funding against projects and strategies submitted statewide.

The DGP (as defined in § 33.2-371) refers to projects and strategies solicited from local governments that address a need for a corridor of statewide significance, regional network, improvements to promote urban development areas, or safety improvements identified in VTrans 2040, the Statewide Transportation Plan. In this program, candidate projects and strategies from localities within a highway

construction district compete for funding against projects and strategies within the same construction district. For both programs, projects and strategies are to be screened, evaluated, and selected according to the process established pursuant to SMART SCALE.

**Table 1.1 Funding Programs**

	High Priority Projects Program	District Grant Program <sup>a</sup>
Capacity Need on Corridors of Statewide Significance	Yes	Yes
Capacity Need on Regional Networks	Yes	Yes
Improvement to Support Urban Development Areas	No	Yes

<sup>a</sup>Only projects submitted by localities are eligible. Projects addressing a safety need identified in VTrans2040 are also eligible under the District Grant Program.

## 1.2 ROLES AND RESPONSIBILITIES

### Commonwealth Transportation Board

The CTB oversees the SMART SCALE project evaluation process. The CTB reviews the scored project list once the evaluation has been released, and uses the scoring, along with other information submitted to the CTB about each project to inform their funding decisions regarding the allocation of funds for the HPPP and the DGP in the SYIP. The CTB is not required to fund the highest-scoring projects and may use other considerations, in addition to the SMART SCALE process, to make final funding decisions. However, if the CTB makes funding decisions that are not consistent with the SMART SCALE evaluation scoring, they will be able to provide a rationale for their decision.

### Office of the Secretary of Transportation

Under the Secretary of Transportation's Office, the Office of Intermodal Planning and Investment (OIPI), Virginia Department of Transportation (VDOT), and Department of Rail and Public Transportation (DRPT) manage the application process. OIPI, with VDOT and DRPT support screens and reviews the projects against the VTrans needs to determine which projects are eligible to compete in the SMART SCALE project prioritization review and evaluation. OIPI, in cooperation with VDOT and DRPT support perform the calculations and determine the ratings for each project. OIPI provides the final evaluation to the CTB and makes the final evaluation public.

### Technical Evaluation Team

A technical evaluation team is responsible for conducting the measure calculations and making qualitative rating assessments for each factor area, for each of the submitted, screened projects in the SMART SCALE process. This evaluation team is comprised of technical staff from DRPT and VDOT. The staff

appointed to the technical evaluation team includes subject matter experts from both the District and Central Office that are experienced with the data, analytical tools, and qualitative content reported for each measure. Duties of the internal technical evaluation team include:

- Validating project information;
- Evaluating project preparation; and
- Calculating scores for submitted projects according to the methodologies set out in Appendices A-F.

A second technical evaluation team conducts redundant evaluations for a ten percent sample selection of projects to ensure consistency and quality control. Projects are randomly chosen for a blind secondary evaluation. A member of the technical evaluation team not involved in the initial analysis conducts the blind independent evaluation to ensure consistency in the development of assumptions and application of analytical methods.

### **External Peer Review**

To ensure the transparency of the SMART SCALE evaluation process, an external review group, consisting of staff representatives from the Virginia Association of Counties (VACO), Virginia Municipal League (VML), Virginia Transit Association (VTA), as well as other non-governmental groups are assembled to provide oversight of the process and methodology and to review the calculated measures and scores for projects.

### **Applicant Responsibilities**

Applicants are responsible for ensuring that all SMART SCALE application requirements are understood. Projects submitted for SMART SCALE funding will be held to basic standard of development to guarantee they can be evaluated reliably throughout the application process. To ensure the submittal of complete applications, it is strongly recommended that applicants complete the following tasks:

- Reach out to VDOT, DRPT and OIPI staff early in the process
- Complete a Notice of Intent to Apply by August 15
- Ensure project meets a VTrans need
- Ensure project and applicant eligibility requirements have been met
- Ensure project is properly defined in terms of scope, schedule, and cost estimate
- Ensure that the project has the support of key stakeholders and the public, after having been identified through a public planning process
- Submit a completed application by September 30, preferably earlier

For information on the required inputs to the SMART SCALE application, please refer to the SMART SCALE Application Guide (available at <http://smartscale.org/resources/>).

## 1.3 STAKEHOLDER INPUT

To develop a fair and informed SMART SCALE project prioritization process that would work across all modes and throughout the Commonwealth, extensive stakeholder input was considered in its initial development. Numerous meetings were held to obtain the input of jurisdictions, agency stakeholders and the public body across the Commonwealth.

Stakeholder engagement continues to be essential for each biennial implementation of the SMART SCALE submission process and evaluation. Collaboration and involvement continues throughout the entire process. At a minimum, the opportunities for stakeholder input include the following:

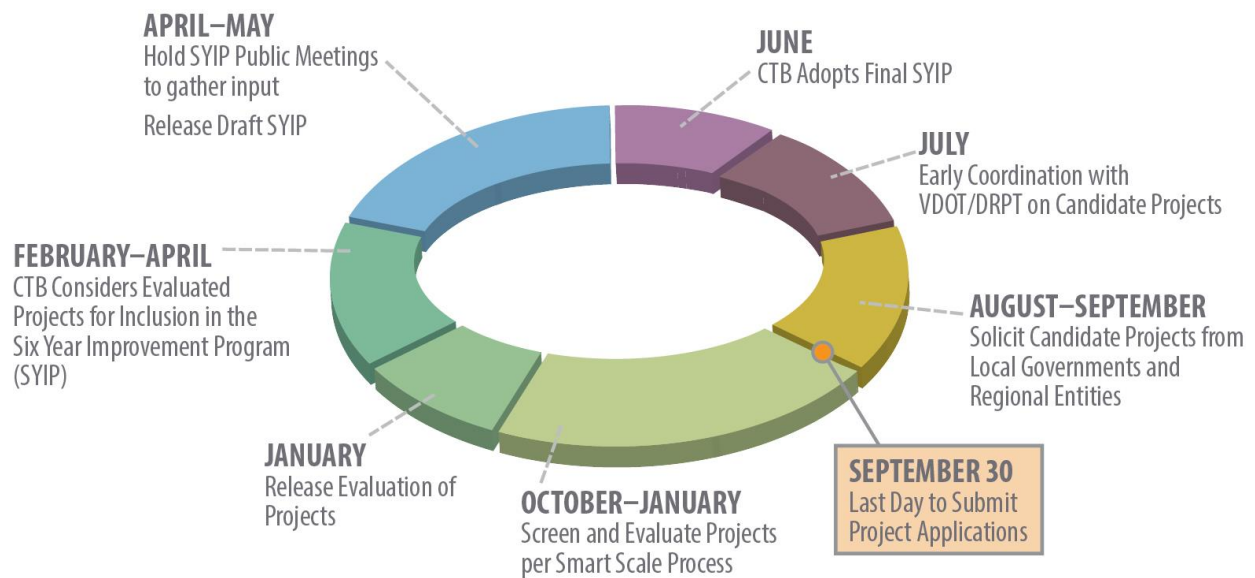
- **Application phase:** Stakeholders have the opportunity to provide input as to what projects the jurisdictions/MPOs/PDCs should consider moving forward in the process through the development of an application for SMART SCALE funds as well as by providing feedback to the CTB during the annual Fall Transportation Meetings. Stakeholders may work with the state to ensure that projects are defined in sufficient detail for SMART SCALE evaluation.
- **Analysis and Scoring phase:** By January of each SMART SCALE cycle, the evaluation of projects selected for SMART SCALE prioritization evaluation will be complete, and scoring will be made public. Stakeholders have the opportunity to review assumptions and calculations and see each project's score.
- **Results and Programming phase:** Every year, during the development of the SYIP, stakeholder input is received during public meetings held following the release of the draft SYIP in April. Stakeholders have the opportunity to provide input upon the projects that were selected for funding for both grant programs.

## 1.4 BIENNIAL SMART SCALE CYCLE

Each year that funding is available, SMART SCALE is planned to operate according to the biennial cycle illustrated in Figure 1.1. Candidate project applications are submitted beginning August 1<sup>st</sup> in even numbered years from eligible entities, with project applications due September 30<sup>th</sup> of the same year. However, project sponsors are encouraged to coordinate well before August with VDOT and DRPT staff. From there, OIPI, VDOT and DRPT screen, review/validate, and evaluate the projects per the SMART SCALE process from October through early January. By mid-January, the list of projects and scores is released to the public and the CTB 30 days before the CTB votes, allowing the

CTB to consider the evaluated project lists for inclusion in the SYIP. In the Spring, the draft SYIP is released by the CTB, followed by public meetings to gather input. In June, the revised final SYIP is released and considered for adoption by the CTB.

**Figure 1.1 Anticipated SMART SCALE Biennial Cycle**



\*The SMART SCALE Biennial cycle only reflects the year applications are due

As currently identified, the application and evaluation process timeline will proceed as follows:

- **Spring/Summer** – Early coordination with DRPT and VDOT prior to application submissions.
- **August** – Call for applications and notification of estimated amount of funding available.
- **August through September** – Applicants coordinate with DRPT staff and VDOT District staff on candidates and submit applications. To guarantee technical assistance from VDOT and DRPT, applicants will be required to complete key data fields in the on-line application tool by August 15<sup>th</sup> indicating their Notice of Intent to Apply. The Notice of Intent to Apply cannot begin until August 1st and must be done in the on-line application tool.
- **September 30** – Applications due. All applications will be made public after the deadline to submit has passed.
- **October through January** – Submitted projects are screened and evaluated.
- **Mid January** – Results of SMART SCALE screening/scoring presented to CTB and public.
- **February through June** – SMART SCALE-funded projects will follow existing public comment period and SYIP approval process.

## 2.0 Project Eligibility and Application Process

This section summarizes project eligibility, screening, and application process considerations for SMART SCALE implementation. Prospective projects must meet or exceed certain qualifications to be considered for evaluation in the SMART SCALE process, and sponsors must provide specific information for eligible projects.

### 2.1 ELIGIBILITY REQUIREMENTS

The types of projects and entities eligible for consideration are described in this section, along with a listing of funding sources not affected by SMART SCALE, and characterizations of entities eligible to submit projects. SMART SCALE projects may be submitted by regional entities including Metropolitan Planning Organizations (MPOs) and Planning District Commissions (PDCs), along with public transit agencies; counties; and cities and towns that maintain their own infrastructure.

Figure 2.1 illustrates the process of determining whether a project has been developed enough to assess its benefits according to the SMART SCALE factors and measures.

#### Eligible Types of Projects

There are several types of projects that are considered for SMART SCALE funding. Highway, transit, rail, road, operational improvements and transportation demand management projects and strategies will be considered. Some specific eligibility requirements include:

- Stand-alone studies are not eligible for SMART SCALE consideration;
- NEPA does not have to be complete, however, the project must be sufficiently developed such that benefits can be calculated;
- For projects that require evaluation of multiple alternatives a valid Preferred Alternative decision should be approved or forthcoming;
- Generally, projects must demonstrate a level of readiness to allow for evaluation of costs and benefits – this is described in Application Process section.

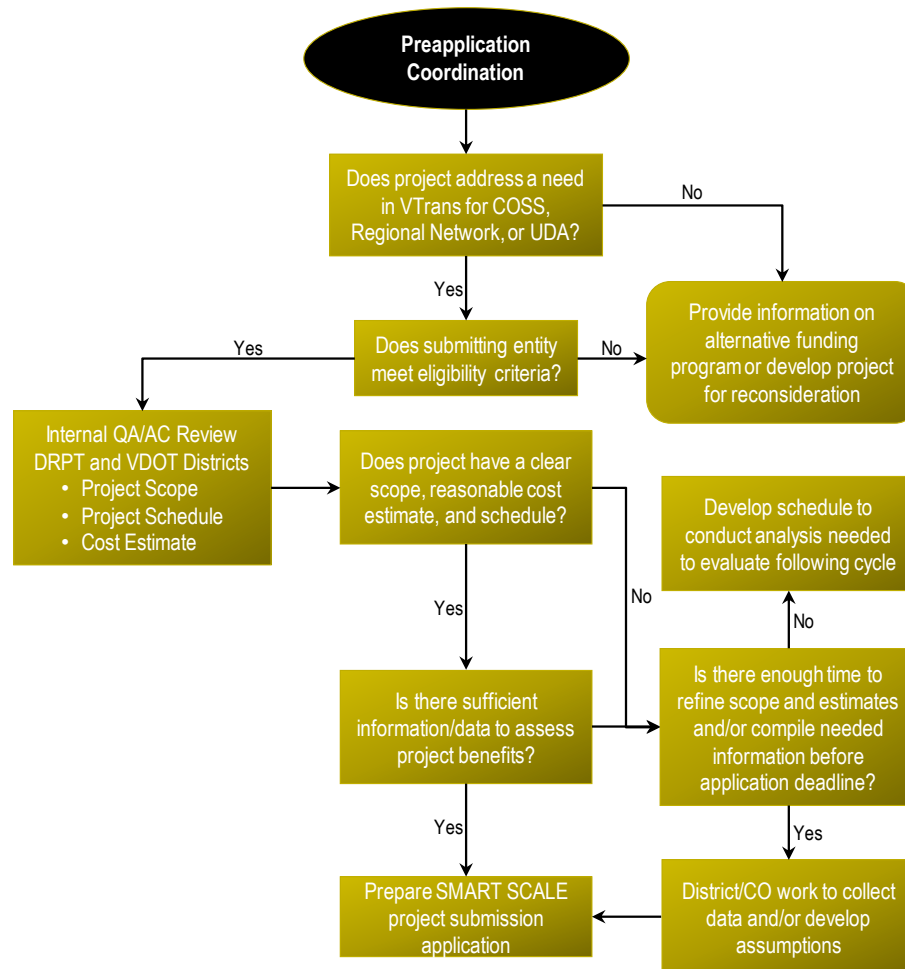
In addition, projects must meet a need identified in VTrans 2040 as defined in SMART SCALE legislation;



*“Candidate projects and strategies shall be screened by the Commonwealth Transportation Board to determine whether they are consistent with the assessment of capacity needs for all corridors of statewide significance, regional networks, and improvements to promote urban development areas established pursuant to § [15.2-2223.1](#), undertaken in the Statewide Transportation Plan in accordance with § [33.2-353](#).”*

VTrans2040, the Commonwealth’s long range transportation plan, consists of two components; the (i) VTrans Vision Plan and the (ii) Virginia Multimodal Transportation Plan (VMTP). The Needs Assessment developed within the VMTP serves as a screen for projects applying for consideration under the SMART SCALE prioritization process. The process for screening projects based on VTrans needs is described in more detail in Section 2.2.

**Figure 2.1 SMART SCALE Project Eligibility and Pre-Application Process**





## Funding Programs

A variety of funding sources are subject to allocation according to the SMART SCALE process. Projects seeking funding from most state and Federal discretionary fund categories are required to go through the SMART SCALE process. However, the following funding categories are exempt from the SMART SCALE process: Congestion Mitigation and Air Quality Improvement (CMAQ) Program funds, Highway Safety Improvement Program (HSIP), Regional Surface Transportation Block Grant Program (RSTBG), Transportation Alternatives (TA) Set-Aside funds (previously known as Transportation Alternatives Program (TAP) under MAP-21), and the Revenue Sharing program. Regional funds for Northern Virginia and Hampton Roads are also exempt from the SMART SCALE process. Funds not subject to SMART SCALE may be allocated to projects and used to leverage/reduce the SMART SCALE fund request.

As described in Section 1, HB1887 established two new funding programs; the HPPP and the DGP. These programs, and the State of Good Repair Program also established by HB1887, replace the previous 40-30-30 system formula and the CTB alternate formula. The HPPP addresses projects of regional or statewide significance and projects will compete statewide for funding. The DGP sets aside funds for each district and projects will compete for funding only with projects submitted by other localities within the same district.

Although both state and Federal funds are expected to be available through the SMART SCALE process, all projects selected for funding that can qualify for Federal funds shall be developed as federally eligible projects.

## Entities Eligible to Submit Projects

While many stakeholders across the Commonwealth have an interest in projects that are considered for funding, only a select group of entities are eligible to submit projects for consideration. Public transit agencies, and regional entities, including Metropolitan Planning Organizations (MPO), the Northern Virginia Transportation Authority, and Planning District Commissions (PDCs) are eligible to submit projects, along with counties, cities, and those towns that maintain their own infrastructure. A summary of the entities eligible to submit projects for SMART SCALE is presented below in Table 2.1.

**Table 2.1 Eligibility to Submit Projects**

Project Type	Regional Entity (MPOs, PDCs)	Locality* (Counties, Cities, and Towns)	Public Transit Agencies
Corridor of Statewide Significance	Yes	Yes, with a resolution of support from relevant regional entity	Yes, with resolution of support from relevant regional entity
Regional Network	Yes	Yes	Yes, with resolution of support from relevant entity
Urban Development Area	No	Yes	No

\* Localities are also eligible to submit projects addressing a safety need identified in VTrans2040 under the District Grant Program.

Note: Resolutions of support may be submitted through December 1 of each year.

Applications for funding through either the HPPP or the DGP must relate to projects located within the boundary of the qualifying entity. Localities and regional planning bodies may submit joint applications for projects that cross boundaries. By majority vote, the CTB may choose to submit up to two projects for evaluation each application cycle.

## 2.2 SCREENING PROCESS

### VTrans Needs Screening

All projects submitted for the SMART SCALE process must pass through an initial screening process conducted by the OIPI team. The project screening is a critical component because it links the planning and programming processes to ensure the overarching transportation goals of the Board are advanced. If a project does not address an identified need in VTrans2040, it cannot move forward in the SMART SCALE process.

VTrans2040 assesses the State's transportation needs at four scales within the VTrans Multimodal Transportation Plan (VMTP) Needs Assessment, with each scale receiving its own set of guiding principles and a unique approach in the plan:

- Corridor of Statewide Significance (COSS) – key multimodal travel corridors that move people and goods within and through Virginia, serving primarily long-distance / interregional travel;
- Regional Networks (RN) – multimodal networks that facilitate intraregional travel within urbanized areas;

- Urban Development Areas (UDA) – areas where jurisdictions intend to concentrate future population and employment growth and development consistent with the UDA section within the Code of Virginia (§15.2-2223.1) (UDA)<sup>1</sup>; and
- Transportation Safety Needs – statewide safety needs identified in VTrans2040 will be eligible for funding under the District Grant Program.

The HPPP (as defined in § 33.2-370) will include projects that address a transportation need identified for a CoSS) or a RN in VTrans2040. The DGP will include CoSS and RN needs, as well as needs identified for UDAs. The DGP may also include safety projects that address a statewide safety need identified in VTrans2040.

Reflecting the organization of VTrans2040, applicants will need to identify which of the three scales primarily best fit their candidate project. A project could address one or multiple scales. This geographic designation will determine which screening criteria that VDOT, DRPT, and OIPI will apply to the project application.

The VTrans2040 website provides all information on the VMTP Needs Assessment

([http://www.vtrans.org/vtrans\\_multimodal\\_transportation\\_plan\\_2025\\_needs\\_a  
ssessment.asp](http://www.vtrans.org/vtrans_multimodal_transportation_plan_2025_needs_assessment.asp) ). The VMTP Needs Assessment as well as the VTrans2040 Vision Plan were [formally adopted](#) by the CTB in December 2015.

### *Needs Screening Approach*

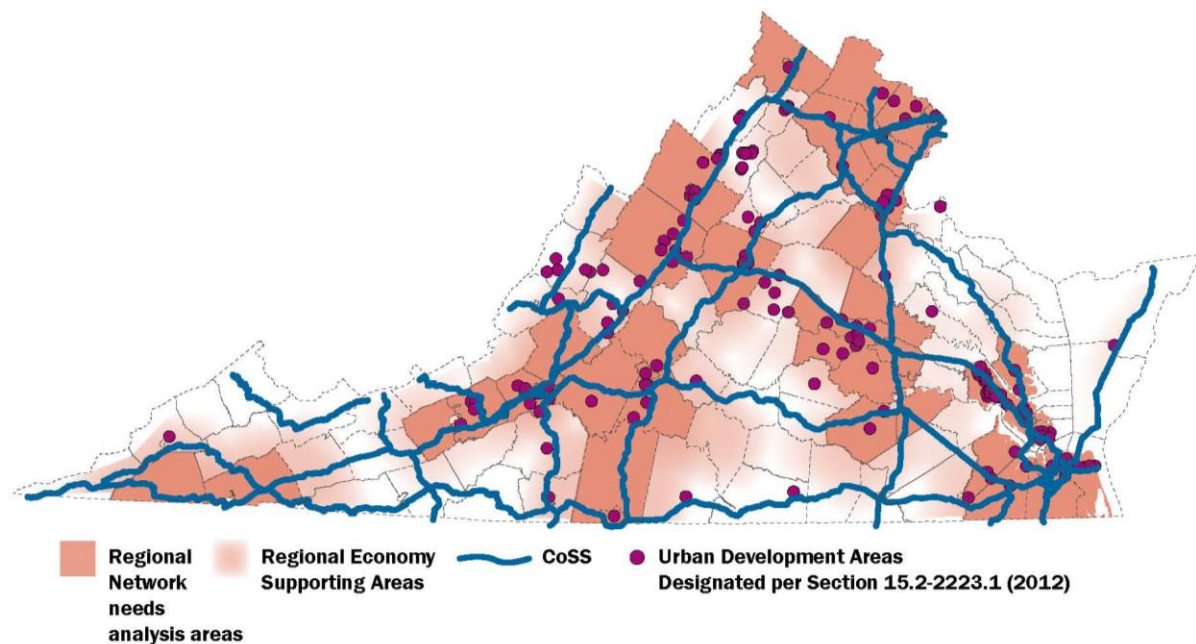
The transportation needs identified within the VMTP Needs Assessment represent broadly defined issues across the four scales (refer to Figure 2.2). Some of the needs are location specific (e.g., a corridor from location x to y, an interchange or group of interchanges, an individual UDA), or in some cases may be more broad and reflect a broad need addressing multiple corridors, travel markets, or trip types.

OIPI is currently developing an interactive mapping framework to depict all the COSS, RN, UDA, and safety needs within a single on-line location. This will provide applicants a more direct resource for reviewing the VMTP Needs Assessment and enable more effective documentation of needs being addressed within project applications.

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<sup>1</sup> Including any locally designated growth areas that have a comprehensive plan reference to the UDA section as qualified for SMART SCALE screening, even if they are not named as UDAs. Designated growth areas with the proper code reference submitted after October 1, 2016 will still be included in the VTrans2040 Multimodal Needs Assessment (VMTP) in an ongoing fashion.

**Figure 2.2 VMTP Needs Assessment – COSS, RN, and UDA Scales Map**



Note: Regional Networks are focused on the MPO areas plus the full county boundaries surrounding them. In some cases needs were identified beyond the county boundaries, in order to reflect needs addressing the connection between exurban and rural areas into the Regional Network. Those needs will also be considered in the screening process.

## 2.3 APPLICATION AND VALIDATION PROCESS

To support the success of the evaluation process, project sponsors are encouraged to coordinate with VDOT and DRPT early in the process to share information on prospective applications. This coordination phase will allow project descriptions and scopes of work, cost estimates, and potential benefits to be developed and refined and will facilitate the application and evaluation process. Additionally, beginning in 2016, project sponsors are encouraged to submit a “Notice of Intent to Apply” within the on-line application tool by August 15. This will facilitate and guarantee assistance from VDOT and DRPT to assist in application preparation. SMART SCALE project submittals must include sufficient information to be evaluated and also need to meet specific application requirements.

## Project Preparation

Projects submitted as candidates for SMART SCALE funding will be held to a basic standard of development to assure that they can be evaluated reliably. VDOT and DRPT intend to provide support to project sponsors prior to application submission to help project sponsors understand and meet expectations. Project sponsors are encouraged to initiate coordination with VDOT and DRPT staff prior to the application period to ensure that candidate projects are adequately developed.

SMART SCALE project applications must include the following information:

- **Scope** – At a minimum, the scope should define the limits of the project, its physical and operational characteristics, and physical and/or operational footprint.
- **Schedule** – At a minimum, the schedule should clearly define the expected process for further project development including key milestones, work activities, related activities, and approvals/approval timelines. The schedule should be realistic and reflect the complexity of the project and identify durations for project phases (PE, RW, CN).
- **Cost** – At a minimum, the cost estimate should be as realistic as possible and should account for applicable risk and contingencies based on the size and complexity of the project. Projects should not be divided/segmented just for the sole purpose of reducing the project cost to improve the SMART SCALE score. Project segments must have logical termini and independent utility.

Projects must meet the relevant federal requirements for inclusion into the Constrained Long Range Plan (CLRP) in order to make use of funding received through SMART SCALE and advance.

Projects with an estimated total cost greater than \$100 million are required by both state and federal code to have a financial plan. The financial plan document provides reasonable assurance that there will be sufficient funding available to implement and complete the entire project as planned. Additional information on financial plan requirements can be found at [http://www.viriniadot.org/projects/financial\\_plans.asp](http://www.viriniadot.org/projects/financial_plans.asp)

The estimated cost to be used on the project application will be significant in determining each project's final score or ranking. Prior to submitting project applications, applicants should work in conjunction with VDOT and DRPT staff to develop reliable cost estimates as part of the application process. Increases in project cost and SMART SCALE funding requests, could result in rescoring of the project as described in Section 5.3.

For projects in which the applicant requests VDOT to administer the project, VDOT will be responsible for providing the applicant with a cost estimate for

each project application. If the applicant has provided an estimate, VDOT will be required to validate the estimate for use on each project application.

For projects in which the applicant requests to locally administer the project (and for all DRPT oversight projects), the applicant must provide a cost estimate for each project application, however VDOT and/or DRPT staff will validate the estimate for use on each project application

## **Pre-Application Coordination and Submission**

VDOT and DRPT strongly encourage early coordination with VDOT and DRPT as they consider projects for application submission. Submission of a Pre-Application Coordination form to VDOT and DRPT prior to August 1st will aid both the applicant and VDOT/DRPT in developing the necessary information for application submission. A Pre-Application Coordination form was developed to provide preliminary guidance to assist SMART SCALE applicants with the development and refinement of potential projects to be considered for the SMART SCALE process. The form provides an opportunity to compile and develop necessary data ahead of the screening and application process. To further facilitate VDOT and DRPT assistance in developing project applications, an applicant can submit a “Notice of Intent to Apply” by August 15<sup>th</sup> to guarantee technical assistance from the two agencies. Both the Pre-Application Coordination form and the Notice of Intent to Apply will identify project readiness issues before submission and provide advance knowledge of the number and type of applications.

The Notice of Intent to Apply requests minimum inputs be provided by the applicant to include the following:

- Project Title
- Principal Improvement
- Organization Name
- POC Name
- POC Phone Number
- POC Email
- Project Description
- Project Administration
- Existing UPCs (if available)

## **Validation (Pre- and Post Application Submittal)**

Upon receiving the notice that the applicant desires assistance, VDOT and DRPT will begin to work with project sponsors to ensure that scope, schedule, and cost estimate for the project are adequate for the evaluation process. Depending on



the completeness of available data, the VDOT and DRPT staff may request additional information or identify issues that need to be resolved. Final submitted applications are reviewed by internal technical staff and must be fully validated to move forward into the evaluation and scoring process.

If there is disagreement concerning the cost estimate or other application data that impacts the score that cannot be resolved between the applicant and VDOT/DRPT local contact, the applicant may request resolution from the VDOT District Engineer / Administrator or the DRPT Director.

Based on the review and validation by internal technical staff, a project application may be recommended to not advance to evaluation since the project type of applicant is not eligible for SMART SCALE or the project has been determined to be insufficiently developed and the benefits cannot be calculated.

Certain projects that are based on conceptual planning-level recommendations and have not been formally scoped or defined may require additional planning/pre-scoping level work before their benefits can be adequately assessed according to the SMART SCALE factors and measures. Planning and pre-scoping resources exist within VDOT, DRPT, localities, regional planning bodies, and some other entities (e.g., SPR, PL, Pre-scoping, FTA 5303, FTA 5304, etc.). However, resources are unlikely to be sufficient to fund every potential request for assistance for project development related to the SMART SCALE process.

## **Application Submittal**

The CTB's goal is to formulate an application process that remains simple and straightforward for applicants. Additionally, staffs from VDOT and DRPT are available for support throughout the process. It is important for applicants to reach a consensus with VDOT and DRPT staff on the scope, schedule and estimate for project submission. A key guiding theme is to develop a process that does not require applicants to invest significant time and resources for submission of project information, or require the use of consultants to develop an eligible application. Early application submission is encouraged to mitigate discrepancies throughout the process.

To further this effort, the on-line application tool has been enhanced to provide the ability to submit applications for other VDOT programs to include Revenue Sharing, Transportation Alternatives (TA) Set-Aside funds (previously known as Transportation Alternatives Program (TAP) under MAP-21), and Highway Safety Improvement Program (HSIP) funds. Additional programs may be added in the future. Additionally, the on-line application tool has been enhanced to allow feedback to applicants during the pre- and post-submission process to assist applicants in moving forward with the process and to communicate progress. VDOT and DRPT staff will provide training and will be available to provide support and tools for applicants in compiling data and information needed for application.

Table 2.2 lists the types of information needed to calculate the prioritization measures and highlights which items will need to be provided by the applicant and which items will be calculated by the Commonwealth. The on-line application tool is electronic and map-based to facilitate automated population of key data elements. This has the potential to reduce the likelihood of data entry errors and improve consistency with VDOT's current scoping form.

Note that if an applicant submits more than one project for consideration, as part of the application process, each applicant will be asked to rank their submitted projects in order of priority.



**Table 2.2 SMART SCALE Measure Data Responsibility**

	Responsibility	
	State	Applicant
<b>All Measures</b>		
Detailed description of improvement		X
Project location		X
<b>Safety</b>		
S.1 - Reduction in number of Fatal and Injury crashes	X	
S.2 - Reduction in Fatal and Injury crash Rate	X	*
Congestion Mitigation		
C.1 - Increase in Person Throughput	X	*
C.2 - Decrease in Person Hours Delay	X	*
<b>Accessibility</b>		
A.1 - Increase Access to Jobs	X	
A.2 - Access to jobs for disadvantaged population	X	
A.3 - Checklist of multimodal elements included in the project (transit, bike/ped, park&ride, etc.)		X
A.3 - Number of non-SOV users	X	*
<b>Environment</b>		
E.1 - Checklist of project elements that contribute to reduced pollutant emissions and/or energy use (transit, bike/ped, park&ride, energy-efficient facilities, etc.)		X
E.1 - Location of improvement on roadways with truck use > 8%	X	
E.1 - Improvements that benefit freight rail or intermodal facilities		X
E.2 - Acres of natural and cultural resources potentially impacted	X	
<b>Economic Development</b>		
ED.1 - Transportation project consistency with Local Comprehensive Plan or Local Economic Development Strategy		X
ED.1 - Transportation project consistency with Regional Economic Development Strategy		X
ED.1 - List of Development projects supported by the transportation improvement (up to 5 miles away depending on project type) including description, square footage, distance from the transportation project, and directness of access that the transportation improvement provides		X
ED.1 - Development project consistency with locality Comprehensive Plan/Zoning		X
ED.1 - Development project site plan status		X
ED.1 - Development project site utilities status		X
ED.2 - Improve access to distribution, intermodal and manufacturing facilities		X
ED.2 - Improve STAA truck route	X	
ED.2 - Improve access reduce congestion ports/airports	X	
ED.2 - Tonnage (1000s) per day	X	
ED.3 - Travel time reliability	X	
<b>Land Use and Transportation Coordination</b>		
L.1 - Promotes walk/bike-friendly, mixed-use development		X
L.1 - Promotes in-fill development		X
L.1 - Corridor/Access management plan that exceeds VDOT standards		X

\* On non-VDOT roadway facilities, the applicant will need to provide year 2025 peak period volume data. For non-roadway (transit, park&ride, bike/ped) projects, applicant will need to provide expected year 2025 peak period usage.

\*Applicants are encouraged to provide supplemental data and analysis, but will not be required.

## 3.0 Evaluation Measures

This section summarizes the evaluation measures that are used in the SMART SCALE evaluation process, and the methods by which those evaluation measures are calculated. SMART SCALE legislation requires that the measures be quantifiable and objective, that the analysis of a project's benefits is relative to its cost (essentially a benefit-cost analysis using the SMART SCALE factors), and that the CTB consider all modes of transportation. The law requires that the measures fall into six factor areas, listed below:

- Safety;
- Congestion Mitigation;
- Accessibility;
- Environmental Quality;
- Economic Development; and
- Land Use Coordination (for areas over 200,000 population).

Using the framework of the six factor areas, VDOT and DRPT used an extensive process to develop the measures for SMART SCALE. The team researched best practices from other state DOTs and MPOs, established a work group focused on measures, held a peer exchange workshop, and conducted lessons learned tasks from the initial round of SMART SCALE. From these working groups and activities, the team gained a key understanding of some guiding principles that should be included in SMART SCALE, formalized into six guiding principles:

- Analyze what matters to people and has a meaningful impact;
- Ensure fair and accurate benefit-cost analysis;
- Be both transparent and understandable;
- Work for both urban and rural areas;
- Work for all modes of transportation; and
- Minimize overlap between measures.

### 3.1 SAFETY MEASURES

The SMART SCALE safety measures evaluate how each project addresses multimodal transportation safety concerns through implementation of best practice crash reduction strategies. Listed below in Table 3.1 are brief summaries

of the two measures. Additional information about the measures, methodologies, and other details are available in Appendix A.

**Table 3.1 Safety Measures**

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
S.1	EPDO of Fatal and Injury crashes	Equivalent property damage only (EPDO) of fatal and injury crashes expected to be avoided due to project implementation	Estimate number of fatalities and injury crashes (weighted by “equivalent property damage only” crash value scale (ratio) used by FHWA) at the project location and the expected effectiveness of project specific counter-measures in reducing crash occurrence	50% <sup>a</sup>
S.2	EPDO Rate of Fatal and Injury crashes	Equivalent property damage only (EPDO) of fatal and injury crashes per 100 million vehicle miles traveled (VMT) expected to be avoided due to project implementation	Similar to S.1, but by focusing on the change in fatality and injury crashes (weighted by “equivalent property damage only” value scale (ratio) used by FHWA) per VMT. The measure considers projects that address areas with a high rate of crashes that may be outside of high-volume roadways	50%

<sup>a</sup> 100% for Transit Projects.

## 3.2 CONGESTION MITIGATION MEASURES

The SMART SCALE congestion mitigation measures evaluate how each project addresses the ability of the transportation system to move people and reduce travel delay across the State. Listed below in Table 3.2 are brief summaries of the measures. Additional information about the measures, methodologies, and other details are available in Appendix B.

**Table 3.2 Congestion Mitigation Measures**

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
C.1	Person Throughput	Increase in corridor total (multimodal) person throughput attributed to the project	Assess the potential benefit of the project in increasing the number of users served within the peak period.	50%
C.2	Person Hours of Delay	Decrease in the number of person hours of delay in the corridor	Assess the potential benefit of the project in reducing peak period person hours of delay.	50%

## 3.3 ACCESSIBILITY MEASURES

The SMART SCALE accessibility measures evaluate how each project addresses worker and overall household access to jobs and other opportunities, as well as

multiple and connected modal choices. Listed below in Table 3.3 are brief summaries of the measures, and additional information is available in Appendix C.

**Table 3.3 Accessibility Measures**

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
A.1	Access to Jobs	Change in cumulative jobs accessibility within 45 minutes (within 60 minutes for transit projects)	Measure assesses the change in cumulative access to employment opportunities as a result of project implementation based on the GIS accessibility tool.	60%
A.2	Access to Jobs for Disadvantaged Populations	Change in cumulative job accessibility for disadvantaged populations and accessibility within 45 minutes (within 60 minutes for transit projects)	Measure assesses the change in existing cumulative access to employment opportunities as a result of project implementation based on the GIS accessibility tool.	20%
A.3	Access to Multimodal Choices	Assessment of the project support for connections between modes, and promotion of multiple transportation choices	Measure assigns more points for projects that enhance interconnections among modes, provide accessible and reliable transportation for all users, encourage travel demand management, and potential to support emergency mobility.	20%

### 3.4 ENVIRONMENTAL QUALITY MEASURES

The two SMART SCALE environmental quality measures evaluate how projects address the reduction of pollutant emissions and energy consumption, and minimize the impact on natural and cultural resources. Measure E.2, which looks at potential impact to natural and cultural resources, is unique among evaluation measures because it is adjusted, or scaled, by the benefit scores for all other measures. Listed below in Table 3.4 are brief summaries of the measures, and additional information is available in Appendix D.

**Table 3.4 Environmental Quality Measures**

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
E.1	Air Quality and Energy Environmental Effect	Potential of project to improve air quality and reduce greenhouse gas emissions	Measure rates a project's potential benefit to air quality and ability to increase energy efficiency or alternative energy use weighted by the total number of users served.	50%
E.2	Impact to Natural and Cultural Resources	Potential of project to minimize impact on natural and cultural resources located within project buffer	Measure evaluates how much sensitive land would be affected within project buffer around the project, and rates projects highest that have minimal or no impacts and are providing benefits in other factor areas.	50%

### 3.5 ECONOMIC DEVELOPMENT MEASURES

The SMART SCALE economic development measures evaluate how each project addresses regional and local economic development plans and new development activity, as well as improvements to intermodal freight movement access and efficiency, and travel time reliability to support the movement of goods and people. Listed below in Table 3.5 are brief summaries of the measures. Additional information about the measures, methodologies, and other details are available in Appendix E.

**Table 3.5 Economic Development Measures**

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
ED.1	Project Support for Economic Development	Project consistency with regional and local economic development plans and policies and support for local development activity	This measure assesses if the project is supporting new and existing economic development and the progress made toward development in the project corridor at the local level. Progress is assessed through use of a checklist of desired actions.	60%
ED.2	Intermodal Access and Efficiency	Rate projects based on the extent to which the project is deemed to enhance access to critical intermodal locations, interregional freight movement, and/or freight intensive industries	<p>This measure assesses the:</p> <p>Level to which the project enhances access to distribution centers, intermodal facilities, manufacturing industries or other freight intensive industries;</p> <p>Level to which the project supports enhanced efficiency on a primary truck freight route (or high volume/ high value truck or rail freight corridor);</p> <p>Level to which the project enhances access or reduces congestion at or adjacent to VA ports/ airports</p>	20%
ED.3	Travel Time Reliability	Improvement in travel time reliability attributed to the project	This measure determines the projects expected impact on improving reliability which supports efforts to retain businesses and increase and economic activity.	20%

### 3.6 LAND USE COORDINATION MEASURES

The coordination between transportation and land use is an important issue within jurisdictions throughout Virginia. SMART SCALE legislation mandates the use of this factor area for metropolitan areas in the Commonwealth with a total population of 200,000 or more. Localities with a population beneath that threshold were given the opportunity to voluntarily choose to use this factor area as well. The goals of the SMART SCALE land use coordination measure are to improve the consistency of the connection between local comprehensive plan goals for transportation-efficient land use and transportation infrastructure design, multimodal accommodation, and system operations. Listed in Table 3.6

is a brief summary of the measure, and additional information is available in Appendix F.

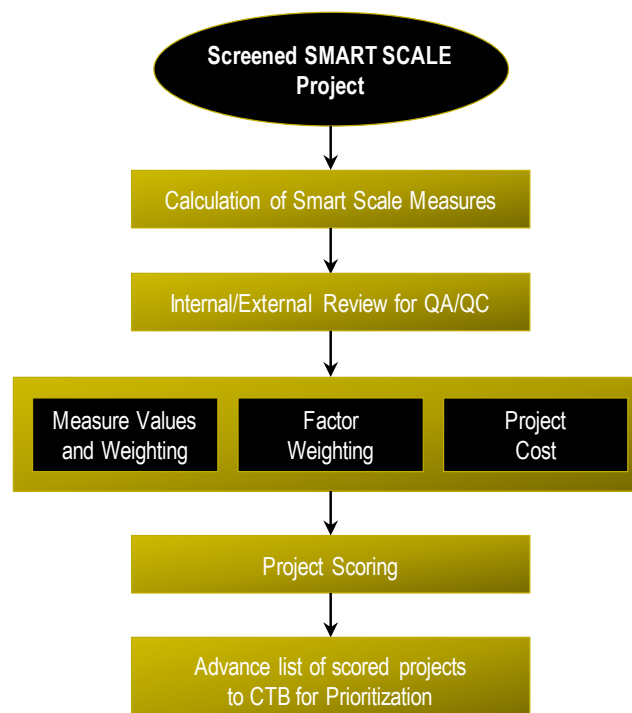
**Table 3.6     Transportation Efficient Land Use Measure**

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
L.1	Transportation Efficient Land Use	Project support for mixed-use development with multimodal choices, in-fill development, and corridor access management policies	This measure determines the degree to which the project and adjacent future land use will help achieve goals for transportation efficient land use.	100%

## 4.0 Project Evaluation and Rating

This section summarizes how projects are evaluated once submitted for consideration in the SMART SCALE process. The CTB's goal is to ensure a transparent process that allows the public and stakeholders to hold decision makers accountable. The flowchart in Figure 4.1 below illustrates the general process of SMART SCALE project evaluation and rating, and will be explored in more details within this section.

**Figure 4.1 SMART SCALE Project Evaluation Process**



### 4.1 CALCULATION OF SMART SCALE MEASURES

The technical evaluation team collects and calculates measures listed in Section 3, spanning the six factor areas. This is an open process that involves state agency collaboration and review from an external team of stakeholders to ensure transparency. Methodologies and specific scoring methods are listed in Appendix A-F for each of the factor areas. As noted in Section 2.3, any applicant submitting multiple projects will be asked to rank their submitted projects in order of priority.

## 4.2 INTERNAL/EXTERNAL REVIEW

A key step in the rating process is to perform quality assurance / quality control (QA/QC) review of the calculated measures for each project. This review will be conducted by internal and external technical groups.

The internal technical evaluation team, consisting of VDOT and DRPT staff, is responsible for developing and reviewing the scoring and evaluations of submitted projects in the SMART SCALE process. Duties of this group include:

- Evaluating screening and validation results;
- Calculating measure scores for submitted projects according to the methodologies set out in the Appendices; and
- Identifying any scoring inconsistencies.

Once initial analysis is done a blind secondary analysis is performed on a minimum of 10 percent of the applications. Projects are randomly chosen for a blind secondary evaluation. A member of the technical evaluation team not involved in the initial analysis conducts the blind independent evaluation to ensure consistency in the development of assumptions and application of analytical methods.

An external review group (ERG), consisting of staff representatives from the Virginia Association of Counties (VACO), Virginia Municipal League (VML), Virginia Transit Association (VTA), and others will provide oversight of the process and methodology and to review the calculated measures and scores for projects.

## 4.3 FACTOR WEIGHTING

The SMART SCALE language in the legislation related to weighting factors by construction districts and within districts recognizes the diversity within each of the nine construction districts as it relates to transportation needs and investment priorities and includes the following:

*"The Commonwealth Transportation Board shall weight the factors used in subdivision 1 for each of the state's highway construction districts (9). The Commonwealth Transportation Board may assign different weights to the factors, within each highway construction district, based on the unique needs and qualities of each highway construction district"*

*"The Commonwealth Transportation Board shall solicit input from localities, metropolitan planning organizations, transit authorities, transportation authorities, and other stakeholders in its development of the prioritization process pursuant to this section. Further, the Board shall explicitly consider input provided by an applicable metropolitan planning organization or the Northern Virginia Transportation Authority when developing the weighting of factors pursuant to subdivision 3 for a metropolitan planning area with a population over 200,000 individuals."*

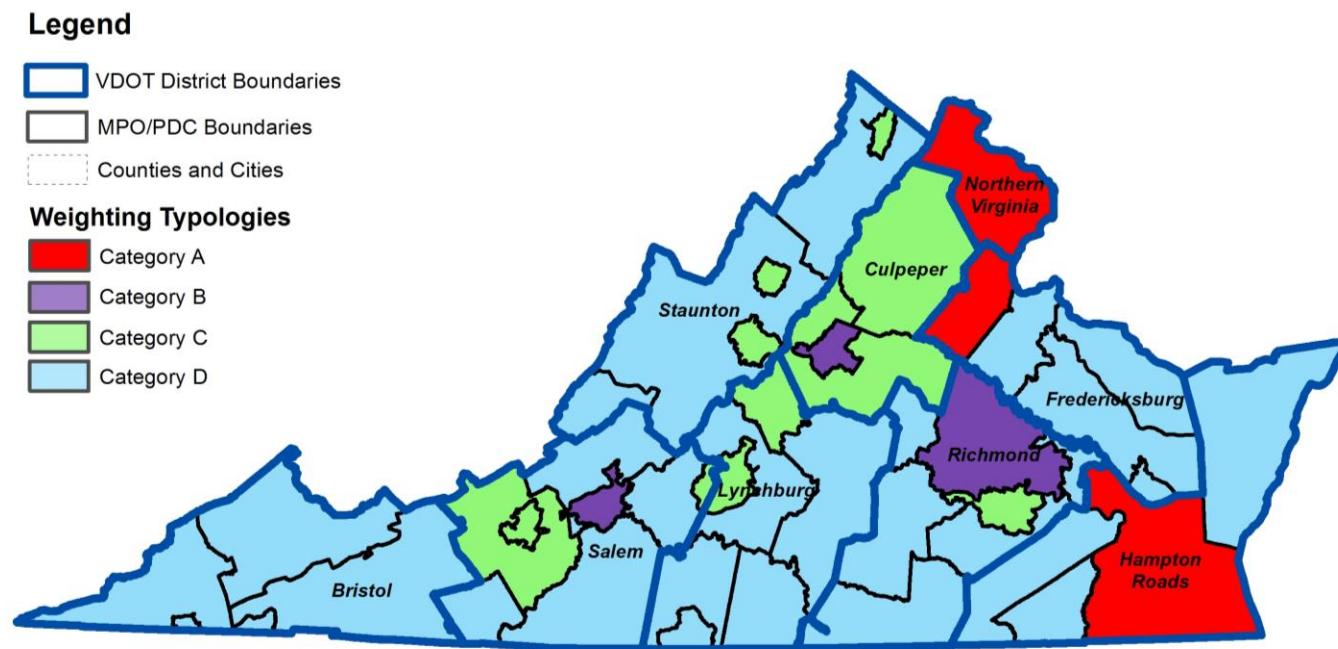


*“Pursuant to Chapter 726 of the 2014 Acts of the General Assembly, that, for Northern Virginia and Hampton Roads highway construction districts, the Commonwealth Transportation Board, pursuant to subdivision B.3 of § 33.2-214.1 as created by this act, shall ensure that congestion mitigation, consistent with § 33.2-257 of the Code of Virginia, is weighted highest among the factors in the prioritization process.”*

Additionally, in the Northern Virginia and Hampton Roads construction districts, congestion mitigation should be weighted the highest of the six factors or the five factors (if outside an MPO boundary, this case only applies in the Hampton Roads district).

Based on a robust public involvement process, Table 4.1 and Figure 4.2 present the final factor weighting categories assigned to each MPO and PDC area.

**Figure 4.2 PDC – MPO Factor Weighting Typology Map**



**Table 4.1 PDC-MPO Factor Weighting Typology**

Name	Typology
Accomack-Northampton PDC	Category D
Bristol MPO	Category D
Central Shenandoah PDC*	Category D
Central Virginia MPO	Category C
Charlottesville-Albemarle MPO	Category B
Commonwealth RC	Category D
Crater PDC*	Category D
Cumberland Plateau PDC	Category D
Danville MPO	Category D
Fredericksburg Area MPO (FAMPO)	Category A
George Washington RC*	Category D
Hampton Roads PDC*	Category D
Hampton Roads TPO (HRTPO)1	Category A
Harrisonburg-Rockingham MPO	Category C
Kingsport MPO	Category D
Lenowisco PDC	Category D
Middle Peninsula PDC	Category D
Mount Rogers PDC*	Category D
New River Valley MPO	Category C
New River Valley PDC*	Category C
Northern Neck PDC	Category D
Northern Shenandoah Valley RC*	Category D
Northern Virginia Regional Commission (NVTA)/ Transportation Planning Board (TPB)2	Category A
Rappahannock-Rapidan RC	Category C
Region 2000 LGC*	Category D
Richmond Regional PDC*	Category D
Richmond Regional TPO (RRTPO)	Category B
Roanoke Valley TPO (RVTPPO)	Category B
Roanoke Valley-Alleghany PDC*	Category D
Southside PDC	Category D
Staunton-Augusta-Waynesboro MPO	Category C
Thomas Jefferson PDC*	Category C
Tri-Cities MPO	Category C
West Piedmont PDC*	Category D
WinFred MPO	Category C

\* PDC defined as the remainder of the region outside the MPO boundary. In many cases, these regions include partial counties (e.g., Goochland County is partially within RRTPO and the Richmond Regional PDC). If a project is within the MPO boundary in a partial county, the project shall use the weighting associated with the MPO with the following exceptions:

- i. Gloucester County portion of HRTPO included within Middle Peninsula PDC typology.
- ii. Fauquier County portion of TPB included within Rappahannock-Rapidan RC typology.
- iii. For projects that cross multiple typology boundaries, the project shall use the weighting associated with the typology for which the majority of the project is located.

The final weighting scheme by category is presented in Table 4.2. Where MPO boundaries cover a partial county, the assumption is that any project partially or wholly within the MPO boundary will use the assigned MPO weighting approach unless noted otherwise in Table 4.1. For projects that cross multiple typologies, the weighting framework from the typology for which the majority of the footprint of the project is located will be utilized.

**Table 4.2 Factor Weights by Category**

Factor	Congestion Mitigation	Economic Development	Accessibility	Safety	Environmental Quality	Land Use
Category A	45% <sup>b</sup>	5%	15%	5%	10%	20% <sup>a</sup>
Category B	15%	20%	25%	20%	10%	10% <sup>a</sup>
Category C	15%	25%	25%	25%	10%	
Category D	10%	35%	15%	30%	10%	

<sup>a</sup> For metropolitan planning areas with a population over 200,000, the prioritization process shall also include a factor based on the quantifiable and achievable goals in VTrans. TPB, HRTPO, RRTPO, FAMPO and RTTPO all meet this definition.

<sup>b</sup> For Northern Virginia and Hampton Roads construction districts, congestion mitigation is weighted highest among the factors in the prioritization process.

## 4.4 PROJECT COST

SMART SCALE mandates that the prioritization process be based on several factors relative to the cost of the project:

*“The prioritization process shall be based on an objective and quantifiable analysis that considers, at a minimum, the following factors relative to the cost of the project or strategy: congestion mitigation, economic development, accessibility, safety, and environmental quality.”*

SMART SCALE costs are used as the basis for the official project score. However information on both SMART SCALE cost and total cost will be provided to the Board for comparison purposes and to show the range of the score between two costs.

Using only the SMART SCALE costs directly accounts for the financial benefit of private, local, or other funding, and reflects the increased leveraging power of state resources. It is acknowledged that this definition of project cost may favor localities with more local financial resources to commit to transportation projects as well as localities with access to regional funds (e.g., Regional Surface Transportation Program (RSTP) funds, Congestion Mitigation and Air Quality Improvement (CMAQ) Program funds, Hampton Roads Transportation

Accountability Commission, Northern Virginia Transportation Authority). However, it is also noted that projects in these large urbanized areas tend to be more expensive due to higher right-of-way and construction costs.

## 4.5 PROJECT SCORING

SMART SCALE requires an analysis of the project benefits for each factor relative to the cost of the project. Each project is scored by calculating values for each of the evaluation measures, converting those values into a score for each factor, and then by weighting the factor scores according to one of several potential weighting frameworks approved by the CTB. Ultimately, a weighted project score is divided by the cost of the SMART SCALE fund request to obtain the final SMART SCALE score used to program funds. In addition, the weighted project score is also divided by the total cost of the project and this figure is provided to the CTB for information purposes.

### *Key Terms*

**Measure Value** – Data calculated for the project that describes the characteristics of the project. Wherever possible, the SMART SCALE measure values should be calculated so they are proportional to the size or impact of the project, even for qualitative measures.

**Measure Score** – Numerical score given to each measure based on the measure value as a percentage of the maximum value (in other word, normalized relative to the highest measure value).

**Weighted Measure Score** – Measure scores within a factor area multiplied by their measure weights.

**Raw Factor Score** – Sum of the weighted measure scores within a factor area.

**Weighted Factor Score** – Raw Factor Score multiplied by the factor weight for using the appropriate weighting framework based on the project location.

**Project Benefit Score** – Sum of the Weighted Factor Scores for each factor area. This represents the total benefits of the project.

**SMART SCALE Score (Project Benefit Score / SMART SCALE Cost)** – Project score divided by the SMART SCALE-funded cost of the project. This index allows projects to be compared in terms of their benefit per SMART SCALE dollar invested. Project costs are applied in units of tens of millions of dollars (\$10 millions).

### *Methodology*

**Step 1** – Within each factor, for each measure, the highest value is determined after calculating the measures for each project. The highest measure value is given a score of 100 percent. Other measure values are compared to the highest

value, and the percentage of the highest value is used as the measure score. An example of normalization is shown in Table 4.3 below.

**Table 4.3 Step 1: Normalization of Measure Weights**

	Project 1	Project 2	Project 3	Project 4
Measure Value	11.62 hours	166.45 hours	1332.85 hours	21131.65 hours
Measure Score	0.05	0.79	6.31	100.00

**Step 2** - Once each measure score has been assigned for a factor, the measure weighting is applied. Each measure within the five or six factors has a measure weight which determines the percentage of the factor score carried by each measure. Once the measure weighting has been applied, the sum of the weighted measure scores produces the raw factor score. Table 4.4 presents an example for the Congestion Mitigation factor area.

**Table 4.4 Step 2: Apply Measure Weights**

	C.1: Person Throughput		C.2: Reduction in Person Hours of Delay		Raw Factor Score: Congestion
Measure Weight	50%		50%		
	<u>Value</u>	<u>Score</u>	<u>Value</u>	<u>Score</u>	
Project 1	4.96	0.01	11.62	0.05	$(50\% * .01) + (50\% * .05) = .03$
Project 2	747.25	1.40	166.45	0.79	$(50\% * 1.4) + (50\% * .79) = 1.1$
Project 3	182.07	0.34	1332.85	6.31	$(50\% * .34) + (50\% * 6.31) = 3.32$
Project 4	53199.96	100.00	21131.65	100	$(50\% * 100) + (50\% * 1000) = 100$

**Step 3** - The raw factor score is then multiplied by the weighting percentage assigned to that factor by the predetermined weighting typology. Table 4.5 demonstrates this factor weighting using example project 2 and the Category A weights. This process is repeated for all applicable factors – their sum producing the final SMART SCALE project benefit score.

**Table 4.5 Step 3: Apply Factor Weights**

Project 2 (Category A Weights)	Congestion Mitigation	Economic Development	Accessibility	Safety	Environmental Quality	Land Use	Final Project Score
Weight	45%	5%	15%	5%	10%	20%	
Factor Score	1.1	2.58	0.16	4.07	0.24	6.91	
Weighted Score	0.495	0.129	0.024	0.203	0.024	1.382	2.24

**Step 4** - The project score is then divided by the SMART SCALE-funded cost of the project (in \$ 10 millions) to determine the value of score for every dollar invested. For example, assume that Project 2 is requesting \$10.2 million in SMART SCALE funds out of a total cost of \$20 million. The project score is 2.26, the cost-effectiveness of this project index would be 2.21 (i.e.  $2.26/1.02 = 2.21$ ) per \$ 10 million dollars of SMART SCALE funds invested. If the total project costs were used, instead of SMART SCALE funds only, the cost-effectiveness of this project would be 1.13 (i.e.  $2.26/2 = 1.13$ ) per \$ 10 million dollars of cost.

Under this scoring process, the maximum measure values may change on a year-to-year basis depending on the characteristics of the projects that are submitted. The aim of this method is to score each project on a scale proportional to its benefits and relative to its cohort of projects rather than an arbitrary scale.

Table 4.6 summarizes the calculation of the SMART SCALE score for the example project described above. This shows how the measure scores and weights, combined with the factor weights, can be used to calculate the total project score. The SMART SCALE score is the project benefit score divided by the SMART SCALE cost.

### **Project Segmentation – Fixed Guideway Projects (Transit Only)**

Some projects are submitted for SMART SCALE that are a segment of a larger project plan with future benefits. The project submitted will not itself provide direct measure values, but future measure values are identified as a result of the submitted project. Under the current methodology, the segment of the project that is submitted will receive no credit for the future benefits it brings. For example, if a project is submitted to extend a platform at a rail station to allow longer trains to be utilized, the benefits for just the extended platform is measured, not the benefits of the future longer railcars that are purchased as a result of the extended platform. To account for future benefits of projects that are segmented, a percentage of the benefits derived from all segments of a larger plan will be used in the scoring of a specific segment. In our example, assuming the rail platform cost \$10 million, and the future purchase of railcars cost \$100 million, benefits would be measured for both, and 10% (\$10 million/\$100 million) of the benefits would be used for scoring the platform project.<sup>2</sup>

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<sup>2</sup> This has very limited applicability and does not apply to roadway widenings

**Table 4.6 Calculate SMART SCALE Score**

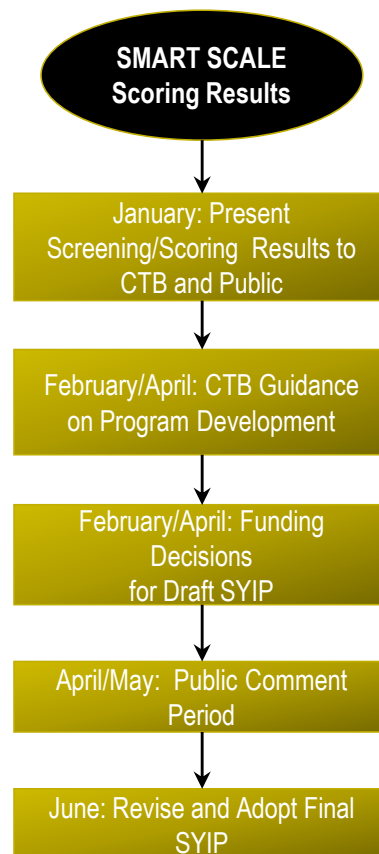
Project Located in Typology Category A													
	Congestion Mitigation		Safety		Accessibility			Environment		Economic Development			Land Use
	Person Throughput	Person Hours of Delay	Number of Fatal and Injury Crashes	Rate of Fatal and Injury Crashes	Access to Jobs	Access to Jobs for Disadvantaged Populations	Access to Multimodal Choices	Air Quality and Energy Environmental Effect	Impact to Natural and Cultural Resources	Project Support for Economic Development	Intermodal Access and Efficiency	Travel Time Reliability	Transportation Efficient Land Use
Measure Score	1.4	0.79	6.9	1.24	0.152	0.18	0.15	0.09	0.39	2.09	2.8	3.83	6.91
Measure Weight	50%	50%	50%	50%	60%	20%	20%	50%	50%	60%	20%	20%	100%
Weighted Measure Score	0.7	0.39	3.45	0.62	0.09	0.04	0.03	0.04	0.19	1.25	0.56	0.77	6.91
Raw Factor Score	1.09		4.07		0.16			0.25		2.58			6.91
Factor Weighting	45%		5%		15%			10%		5%			20%
Weighted Factor Score	0.49		0.2		0.024			0.024		0.13			1.38
Project Score	2.26												
Total Project Cost	\$20,000,000												
Score Divided by Total Cost	1.13												
SMART SCALE Cost	\$10,200,000												
Project Benefit Score / SMART SCALE Cost	2.211												



## 5.0 CTB Prioritization and Programming

This final section summarizes CTB prioritization and programming methods that are used in the SMART SCALE process, specifically how SMART SCALE scored projects are reviewed, and ultimately, incorporated into the SYIP. The flowchart in Figure 5.1 below illustrates the basic process of the final stages of the SMART SCALE Annual Process, in which the CTB begins with the scoring results from the SMART SCALE evaluation and rating process, and funding decisions for the draft SYIP.

**Figure 5.1** Prioritization and Programming Process



First, the SMART SCALE technical review team presents the screening and scoring results to both the CTB and the public. The CTB gives guidance on program development, and begins to narrow down their funding decisions for projects that will be funded in the draft SYIP. Their decisions are represented in the draft SYIP. After the draft SYIP is presented, the CTB holds a public comment period that allows eligible entities to comment on the process, on screening decisions, and on the scoring of individual projects. The CTB takes into account public comments based on the draft SYIP, ultimately approving the final SYIP in June.

## **Funding Decisions for Draft SYIP**

Pursuant to Section 33.2-214 of the Code of Virginia, each year the CTB must approve a capital improvement program that outlines planned spending for transportation projects for proposed construction development or study for the next six years. The SYIP covers all surface transportation projects, including highway, transit, rail, roadway, technology operational improvements and transportation demand management strategies. Project funding is programmed in accordance with project schedules and cash flow requirements. The CTB updates the SYIP each year as revenue estimates are updated, priorities are revised, project schedules and costs change, and study results are known.

Information from the fall transportation meetings and results of the scoring process are utilized by the CTB to direct the development of a draft SYIP. The draft SYIP is presented to the CTB each spring. At that time the draft SYIP is made available for public comment. A final SYIP is presented to the CTB in June each year for approval. Upon adoption of the SYIP by the CTB, the new SYIP goes into effect on July 1.

Once the scoring is complete, additional considerations are used to develop a recommended list of improvements for the CTB to consider in developing the next capital improvement program. These include:

- Public feedback from Fall Transportation Meetings and Spring public meetings;
- SMART SCALE scores;
- Project segmentation – starting the next phase of a multi-segment roadway improvement, e.g., to complete a major multi-segment project; and
- Other information on project status.

The prioritization process does not require that the CTB funds projects in order of their scoring. Further, the CTB is not required to select the highest scoring project. The process is a means to assist the CTB in evaluating and comparing proposed improvements. The CTB continues to retain final decision-making authority on improvements to be included in the SYIP.

## 5.1 PUBLIC COMMENT PERIOD

The CTB provides numerous opportunities for the public to provide input on transportation projects and priorities as part of the continuing transportation planning process. The CTB holds annual Fall Transportation Meetings in the construction districts, providing public and elected officials with an opportunity to identify transportation priorities and to review and comment on the current SYIP. VDOT and DRPT also hold an annual planning and programming meeting inviting representatives from all MPOs and PDCs to attend and provide their transportation priorities prior to the annual development of the SYIP. Each spring, the draft SYIP is made available for public comment and VDOT and DRPT host public meetings. Attendance at the Fall Transportation Meetings and spring public meetings generally includes elected state officials, city and town officials, members of County Boards of Supervisors, representatives of advocacy groups, representatives from MPOs and PDCs, and the general public. Comments are accepted both verbally and in writing at the meeting or via regular mail or email after the meeting.

## 5.2 ADOPTION OF SYIP

Once the projects are scored and public comments on the draft SYIP are received, the CTB selects a final list of projects for funding. To meet its statutory obligation, the CTB will adopt a SYIP in June of each year effective July 1<sup>st</sup>, though SMART SCALE will only happen every other year.

Key milestones for the adoption the first SYIP (FY 2017-FY 2022) that includes SMART SCALE projects include the following:

- **July 2015:** Early coordination between project sponsors, VDOT, and DRPT staff.
- **August 2015:** Call for candidate projects.
- **September 30, 2015:** Applications due.
- **Fall 2015:** Fall transportation meetings, public input on candidate projects.
- **Early 2016:** Screening and scoring results released, followed by public input.
- **Spring 2016:** CTB will select the final list of projects for funding to be included in the draft SYIP.
- **April 2016:** Draft SYIP released, followed by public meetings.
- **June 2016:** Final SYIP adopted.

## 5.3 PROCESS ISSUES

The CTB adopted an updated SYIP policy on October 27, 2015 with changes to the programming process intended to: i) improve transparency in the

programming process, (ii) increase certainty for local project sponsors, citizens and businesses, and (iii) accelerate delivery of selected projects. This policy document outlines key provisions in the following areas:

- » Frequency of updates to the SYIP and to HPPP and DGP;
- » Changes relating to modification of the amounts of funds previously committed and programmed to projects under certain programs;
- » All SMART SCALE projects selected for funding under the HPPP and the DGP must be fully funded and demonstrate the Board's commitment to advance the project through construction;
- » The Board will select a preferred prioritization scenario to guide allocation of funds and consider modifications to the preferred prioritization scenario;

Some of the specific process issues pertaining to SMART SCALE are outlined below.

### **Changes in Project Scope/Schedule/Cost**

In general, once a project has been screened, scored, and selected for funding by the (CTB), it will remain in the SYIP as a funding priority. Certain circumstances may warrant a re-evaluation of the project score and funding decision.

Important Considerations:

- It is important to ensure the integrity of the SMART SCALE scoring process, the original intent/benefits of scored projects, and the CTB's allocation decisions. Changes to these basic elements (scope or cost) could result in funding projects that are not as cost effective when decisions to fund those projects are made by the CTB.
- In addition, allowing minor adjustments within the established thresholds ensures that minor changes to a project scope and/or estimate can be addressed through business rules without requiring CTB action, and avoiding potential project delays.

A project that has been selected for funding must be re-scored and the funding decision re-evaluated if there are significant changes to either the scope or cost of the project, such that the anticipated benefits relative to funding requested would have substantially changed in any of the following situations:

1. If an estimate increases prior to project advertisement or contract award that exceeds the following thresholds, and the applicant is not covering the increased cost with other funds, CTB action is required to approve the budget increase:
  - Total Cost Estimate <\$5 million: 20% increase in funding requested
  - Total Cost Estimate \$5 million to \$10 million: \$1 million or greater increase in funding requested

- Total Cost Estimate > \$10 million: 10% increase in funding requested; \$5 million maximum increase in funding requested
2. If the project scope changes and is significant enough to impact the anticipated benefits associated with the project or to require the location decision, the environmental review process (NEPA), or public hearing to be revisited, rescoring may be needed. In this case, if the revised score is less than the lowest ranked funded project in the district for that cohort of projects, CTB action is required to approve the change in scope. If the scope change is also associated with a budget increase, the applicant is responsible for funding the increase. The scope of a project may not be substantially modified in such a manner that the proposed improvement does not accomplish the same benefits as the original scope.
  3. Significant reduction in the locally/regionally leveraged funds available for the project. In the cases where a project has been selected for funding which identified other sources of funding, the qualifying entity is committed to pay the difference if other sources of funding are not provided.

## Funding Sources

In the case where a project has been selected for funding which identified other sources of funding, the qualifying entity is committed to pay the difference if other sources of funding are not provided.

Other sources of funding may include pending applications for VDOT or DRPT funding programs (Revenue Sharing, Transportation Alternatives (TA) Set-Aside funds, FTA Programs), regional funding (CMAQ/RSTP), or local funds requested from the BOS or City/Town Council. An explanation of the source of the requested funding must be provided. The applicant must provide documentation of other requested funds; such as resolutions of support, letter, applications, etc. In the cases where a project has been selected for funding which identified other sources of funding, the applicant is committed to pay the difference if other sources of funding are not provided.

A project that has been selected for funding must be initiated and at least a portion of the programmed funds expended within one year of the budgeted year of allocation or funding may be subject to reprogramming to other projects selected through the prioritization process. In the event the Project is not advanced to the next phase of construction when requested by the Commonwealth Transportation Board, the locality or metropolitan planning organization may be required, pursuant to § 33.2-214 of the Code of Virginia, to reimburse the Department for all state and federal funds expended on the project.

## Re-Submittal of Projects

If a submitted project is not selected for funding during a cycle, the CTB will allow eligible entities to re-submit the project the next cycle.

Other considerations regarding resubmittal of projects include the following:

- A project that has been selected for funding cannot be resubmitted to address cost increases or loss of other sources of funding.
- Once a project is selected for funding, an entity must wait for two rounds of SMART SCALE following the end date of construction before submitting a new project application for the same location that meets the same need as the project that was selected for funding.
- Once a project is selected for funding, an entity may not resubmit the project with a revised scope in a subsequent round unless the previously selected project has been cancelled.

## Program Funding Changes

In order to cover estimate increases, funds will be reprogrammed from projects with surplus allocations due to estimate decreases, contract award savings, schedule changes, etc. or from future SMART SCALE funds. Regular reviews will be conducted to ensure that the scope and benefit of selected projects has not changed significantly. Project estimates will also be monitored to determine if the thresholds need to be adjusted.

In the event that revenue reductions decrease the amount of actual funding available for a particular SMART SCALE cohort, two approaches are envisioned:

- Delaying timing of projects to out years where future funding may be available; or
- Utilizing SMART SCALE funds from future years to fund the project.

## 5.4 IMPROVEMENTS TO PROCESS AND MEASURES

SMART SCALE is a new step forward for the Commonwealth of Virginia, and the CTB is breaking new ground in moving towards a prioritized transportation funding structure. As the process moves into future cycles, SMART SCALE will continue to evolve and improve. Advances in technology, data collection, and reporting tools will upgrade and modernize SMART SCALE for a growing Virginia, and the CTB looks forward to using these tools to provide a more balanced and equitable distribution of the Commonwealth's transportation funds.



## 6.0 Appendix A: Safety Measures

**Table 6.1 Safety Factor – Measures Summary**

ID	Measure Name	Weight	Measure Description	Measure Objective
S.1	EPDO of Fatal and Injury crashes	50% <sup>a</sup>	Equivalent property damage only (EPDO) of fatal and injury crashes expected to be avoided due to project implementation	Estimate number of fatalities and injury crashes (weighted by “equivalent property damage only” crash value scale (ratio) used by FHWA) at the project location and the expected effectiveness of project specific counter-measures in reducing crash occurrence
S.2	EPDO Rate of Fatal and Injury crashes	50%	Equivalent property damage only (EPDO) of fatal and injury crashes per 100 million vehicle miles traveled (VMT) expected to be avoided due to project implementation	Similar to S.1, but by focusing on the change in fatality and injury crashes (weighted by “equivalent property damage only” crash value scale (ratio) used by FHWA) per VMT, the measure considers projects that address areas with a high rate of crashes that may be outside of high-volume roadways

<sup>a</sup> 100% for Transit Projects

### Measures Approach

#### *S.1 Equivalent property damage only (EPDO) of Fatal and Injury crashes*

**Definition:** EPDO-weighted fatal and injury crashes expected to be reduced due to project implementation.

#### **Data Source(s)**

- Most recent five years of crashes from VDOT Roadway Network System (RNS) GIS data maintained by Traffic Engineering Division.
- Six-year Improvement Program to determine if and when improvements have been implemented in the last five years.
- Project expected crash reduction percentage developed using FHWA’s Crash Modification Factors (CMF) Clearinghouse website and Virginia crash summaries and models.<sup>3</sup>
- For park and ride projects, identify the location of the project using information from Census data to determine the average commuting distance.<sup>4</sup>

<sup>3</sup> <http://www.cmfclearinghouse.org/>



## Methodology

The methodology varies by project type, as described below.

### Roadway

Step 1: VDOT will compile the latest 5 years of fatal (F) and injury (I by severity) crashes for the roadway segments within the project limits. The project limits are defined by the begin and end milepost for roadway, pedestrian, bicycle, in-roadway transit service (e.g., bus rapid transit), in-roadway freight service corridor improvements; the ends of the turn bays on all approaches for intersection improvements; the nearest intersection(s) on the cross street for a new interchange as well as adjacent ramps on the freeway within 1,600 feet of any proposed interchange ramp; and the begin and end milepost on key parallel roadway(s) (facilities where vehicles may shift from) for transit and freight improvement projects. The SYIP will be reviewed and local VDOT staff will be queried to determine if and when improvements have been implemented within the project limits during the 5 year analysis period. The analysis period will be shortened to the post improvement years as necessary.

Step 2: Select the most appropriate expected crash reduction (PECR) percentage (PECR=1-CMF) for each of the project segments based on a set of CMFs applicable to SMART SCALE project types.

Step 3: Multiply the total average annual fatal and injury crash frequency by the PECR to estimate the number of crashes expected to be reduced.

- For roadway widening (capacity) projects, the previously described steps are applied using crashes on the highway segment from the beginning and end mile points of the project plus influence areas of intersections at the terminals.
- For intersection related improvement projects, crashes in the influence area of the minor roadway approaches to the major roadway, which is defined as the highest volume facility, will be included for those minor roadways recorded in VDOT's RNS roadway inventory. The minor roadway approach improvement influence area is considered to be 250 feet or the length of existing turn lanes, whichever is greater.
- For projects on roadways on new location, crashes on the most reasonable alternative route(s) would be compiled. The statewide 5-year average fatal and injury crash rate for the new roadway, using the facility type and number of lanes of the new roadway, would represent the build condition. Based on travel demand model estimates of VMT for the build versus no-build scenarios, percent changes in VMT on each alternate route segment equates to the CMF applied. The difference between the expected crashes on the alternative route(s) and the expected crashes on the build corridor equals

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<sup>4</sup> <http://onthemap.ces.census.gov/>

the overall project crash reduction. The alternate routes with expected changes in traffic volumes may be identified by the applicant.

- New interchanges and interchange ramp modifications on the freeway will consider freeway and crossing route crashes depending on the specific ramp improvements in proposed projects.

Step 4: Weight the number of crashes by “equivalent property damage only” crash value scale (ratio) used by FHWA. The weight or ratio conversion table is shown below.

**Table 6.2 EPDO Conversion Table**

Accident Type	Value	Weight
Fatal	\$5,400,000	540
Severe Injury	\$300,000	30
Moderate Injury	\$100,000	10
Minor Injury	\$50,000	5

### Transit/Freight Rail/TDM

The methodology described for roadway projects cannot be used for transit infrastructure projects given the limited information available on safety benefits from transit measures to all of the roadway users. For on-road transit projects, for example a bus-only lane or new transit route in mixed traffic, and for off-road (dedicated guideway) transit projects, safety benefits will be estimated based on expected shift from auto to transit with the assumption that dedicated transit vehicles have minimal crash frequencies. The same approach as described for off-road transit projects would be applied to freight rail projects, except the focus will be on the 5-year average of truck-related fatal and injury crashes in the parallel corridor. For TDM projects like park and ride lots, the same approach as described for off-road transit projects would be applied taking into account the traffic reductions on adjacent highways.

### Transit/Freight Rail/TDM service safety analysis includes the following steps:

Step 1: Project sponsor identifies segments of highway with new on-road transit service and key parallel roadway(s) to new on-road and fixed guideway transit projects that will experience the primary travel shifts. For Park and Ride lot ride-sharing TDM projects, the applicant shall provide the increase in parking spaces. For each highway and fixed guideway transit segment with new service, the applicant sponsor shall provide the daily and hourly ridership. Ride-sharing increase estimate impacts on daily traffic volumes (thus VMT) are provided by the Congestion Measure analysis outputs. The highway segments impacted by a mode shift will be assessed to determine the percent VMT change on the network; that is, the expected percent modal shift from highway (VMT) to

transit/ride-sharing due to the project. The after project VMT will be one minus the percent model shift (VMT After = 1 – % VMT Reduced).

Step 2: For corridor transit service projects or freight rail projects, crashes from roadway segments within the project limits (in the case of an on-street bus or rail transit project) and/or on key impacted parallel roadways from where the vehicle traffic may be reduced (in the case of a facility that is separated from the travel lanes). For Park and Ride improvements, crash frequencies are retrieved for the defined roadways and their extents provided by the Congestion assessment.

Step 3: Compute the 5-year annual average F+Injury crash frequencies for the on-road segments and impacted parallel roadways.

Step 4: Calculate the expected reduction of annual F+Injury crash frequencies for on-road and parallel roadway segments by multiplying the existing crash frequency by the after project percent VMT change.

Step 5: Compute the total expected number of F+Injury crashes reduced = annual average F+Injury crashes reduced summed for all project segments.

Step 6: Weight the number of crashes by “equivalent property damage only” crash value scale (ratio) used by FHWA. The weight or ratio conversion table is shown below.

Accident Type	Value	Weight
Fatal	\$5,400,000	540
Severe Injury	\$300,000	30
Moderate Injury	\$100,000	10
Minor Injury	\$50,000	5

**Table**  
**6.3 EPDO**  
**Conversion Table**

### Bicycle/Pedestrian

The methodology described for roadway projects will be used for bicycle and/or pedestrian projects based on the proposed segment and/or intersection improvement CMFs. CMFs from FHWA and other sources were developed based on the associated roadway element improvement CMF for all motor vehicle crashes (not just those involving the non-motorized users). Other alternative sources of information may be developed to assess the safety benefit of these project types based on bicycle facility classification or facility separation from travel lanes.

### Scoring Value

Total change in EPDO of fatal and injury (F+I) crash frequency.

### *S.2 Equivalent property damage only (EPDO) Rate of Fatal and Injury crashes*

**Definition:** Number of Equivalent Property Damage Only (EPDO) weighted fatal and injury crashes per 100 million vehicle miles traveled (VMT) expected to be reduced due to project.

#### **Data Source(s)**

- Five years of crashes (anticipated 2010–2014) from VDOT RNS GIS data prepared by Traffic Engineering Division.
- Six-year Improvement Program to determine if and when improvements have been implemented in the last five years.
- Existing AADT by roadway segment from VDOT RNS or jurisdiction, and segment(s) distance to calculate annual VMT.
- Project expected crash reduction percentage developed using FHWA’s CMF Clearinghouse website and Virginia crash summaries and models.

#### **Methodology**

The methodology varies by project type, as described below.

##### **Roadway and Bicycle/Pedestrian**

Step 1: Collect and use the most recent years AADT to calculate the annual VMT for the same segment(s) used for the crash data collection for the S.1 measure.

Step 2: Match the project location segment VMT with the expected EPDO of F+I crashes reduced by the project from the S.1 measure.

Step 3: Compute the expected F+I crash rate reduction as a result of the project improvements = the S.1 reduced annual average EPDO of F+I crashes divided by the segment VMT. For longer projects covering several segments with different AADT values, the average annual crash rate reduction is the sum of the segment reduced crashes over the sum of the segment VMTs.

The methodology varies by project type, as described above for S.1 crash frequency reduction assessments.

##### **Transit/Freight Rail/TDM**

The methodology described for roadway projects cannot be used for transit projects. For on-road and off-road (dedicated guideway) transit projects, only the S.1 measure of the total EPDO of F+I crash frequency reduction will be used so the transit safety score will be based on the S.1 result. The same approach as described for transit would be applied for Freight Rail types of project except the focus will be on the 5-year average of truck-related fatal and injury crashes in the parallel corridor.

### Scoring Value

Expected reduction in EPDO offatal and injury (F+I) crash rate.

## 7.0 Appendix B: Congestion Mitigation Measures

**Table 7.1 Congestion Mitigation Factor – Measures Summary**

ID	Measure Name	Weight	Measure Description	Measure Objective
C.1	Person Throughput	50%	Increase in corridor total (multimodal) person throughput attributed to the project	Assess the potential benefit of the project in increasing the number of users served within the peak period.
C.2	Person Hours of Delay	50%	Decrease in the number of person hours of delay in the corridor	Assess the potential benefit of the project in reducing peak period person hours of delay.

### Measures Approach

#### C.1 Person Throughput

**Definition:** Change in corridor total (multimodal) person throughput attributed to the project.

#### Data Source(s)/Analytical Tools

- Latest available 24-hour traffic count data summarized by hour, direction, and roadway segment, including vehicle classification, where applicable, from VDOT TMS, or jurisdiction.
- Latest available regional travel demand model encompassing the influence area only for projects consisting of new transportation facilities.
- Existing AADT by roadway segment from VDOT TMS or jurisdiction.
- Lane capacity is set by the current functional classification of the roadway. In the case of a new location roadway, the planned functional classification is used. Lane capacities were established based on an average of the capacities outlined in the *ENTRADA User's Guide*, February 2014 and the [Virginia Travel Demand Modeling Policies and Procedures Manual Version 2.0](#)
- Obtain lane capacities for different facility types (i.e., freeway, collector, etc.) and area types from the *ENTRADA User's Guide*, February 2014. The urban threshold for capacity will be used statewide and is generally based on LOS D/E.
- For park and ride projects, identify the location of the project using data from the U.S. Census Bureau's OnTheMap tool to query the population within 3 miles of the proposed park and ride improvement. The OnTheMap tool

provides data that can be used to determine the average commuting distance and direction for this population.

- For transit projects, Department of Rail and Public Transportation (DRPT) will provide estimated daily ridership and hourly ridership for the proposed service.
- For new managed lane projects, assumed occupancy rates will be provided by VDOT.
- For roadway projects, SPS will be used to determine number of lanes, lane widths, speed limit, terrain (e.g., level, rolling, mountainous), lateral clearance, number of driveways on arterials, interchange density on freeways, and median type on arterials.
- Latest available aerial imagery used to determine merge, diverge, and weaving lengths on freeways and verify other data from SPS.
- FHWA Cap-X: evaluation tool that uses critical lane volumes (CLV) to evaluate the efficiency of intersections and interchanges.
- Potential traffic growth rate sources include VTrans2040, SPS, and travel demand model.
- Highway Capacity Software (HCS) 2010 – Freeway Facilities Module.
- Modified Bureau of Public Roads (BPR) spreadsheet.

### Methodology

The methodology is a quantitative, corridor-based analysis that requires an estimate of future no-build (without the project) and build (with the project) person throughput. It is anticipated that project corridor will consist of an intersection or segment within the corridor depending on the project type. The segment within the corridor with calculated person throughput increase above zero is used for analysis purposes.

The methodologies to determine person throughput for roadway, bicycle/pedestrian, transit, TDM (including park and ride lots), and freight projects are described below, starting with roadway projects.

For all project types described in this section, person throughput is only credited/ scored if the facility is over capacity in the no-build project condition (has a volume to capacity ratio greater than 1.0)

**Roadway:** There are four types of analyses used to quantify the change in person throughput as a result of a proposed roadway project:

- Basic roadway segment (freeway, rural multilane, rural two-lane), urban arterial (segments between signals are combined with delay calculations from Cap-X to establish no-build versus build average travel speeds)
- Freeway facility (diverge, merge, weave)

- Intersection or interchange, and
- New/Complex facilities - Interstate capacity expansion projects greater than 2 miles in length are defined as complex.

The methodology to compute the change in person throughput will be described for each of the four facility types listed above. The methodology for the analysis of first two facility types is the same.

### **Basic Roadway Segment/ Freeway Facility**

Basic segments represent uninterrupted-flow conditions and have no fixed causes of delay or interruption external to the traffic stream. This category includes two-lane highways, multilane highways, and basic freeway segments as defined in the *2010 Highway Capacity Manual*. Freeway facilities also represent uninterrupted-flow facilities consisting of continuously connected segments that include: basic freeway, weaving, merge, and diverge segments. In order to calculate average travel speeds along signalized arterial routes, basic roadway segment sheets are coded along the project length and are combined with the Cap-X analysis to compute the no-build and build average travel speeds.

A modified Bureau of Public Roads (BPR) equation is used for the analysis of these types of facilities. Nationally, the BPR equation is the mostly widely used volume-delay function for road segments. The equation addresses the relationship between volume and capacity on the segment, with the result being the delay associated with traffic volumes. Capacity in the BPR equation is based on the area type and facility type.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using some of the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Determine the peak period flow rate on the roadway segment without the project and with the project. Using the capacity values by functional classification, compute the vehicle throughput without the project and with the project.

Step 3: Compute the change in peak period vehicle throughput by subtracting the no-build vehicle throughput from the build vehicle throughput.

Step 4: Compute the peak period person throughput for no-build and build conditions by multiplying an average vehicle occupancy rate by the vehicle throughput.

### **Intersection/ Interchange**

Intersections and interchanges represent interrupted flow conditions with features that create delay such as traffic signals.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.



Step 2: Use FHWA CAP-X analysis tool to determine the intersection / interchange critical lane volumes and to estimate the vehicle throughput for the no-build and build conditions.

Step 3: Compute the change in peak period vehicle throughput by subtracting the no-build vehicle throughput from the build project vehicle throughput.

Step 4: Compute the peak period person throughput for without and with conditions by multiplying an average vehicle occupancy rate by the vehicle throughput.

### **New Roadway Facilities**

Estimating vehicle throughput for new roadway facilities requires the use of a regional travel demand model. The project is added to the regional travel demand model and model outputs are then used to summarize with project vehicle throughput.

Step 1: Code the new facility into the regional travel demand model with assumed posted speed limit, facility type, and number of lanes.

Step 2: Identify links in the regional network operating below the speed limit in future no-build scenario with greater than 10% reduction of traffic for the different alternative improvements compared to the no build scenario. Calculate total difference in VHT for these links between the no-build model and the build model.

Step 3: Multiplying the difference between the no-build VHT from the build VHT by 30% to convert to peak period delay reduction (expressed in vehicle hours).

Step 4: Compute the average system project throughput by multiplying the difference between the no-build VHT from the build VHT by 60 to convert to vehicles minutes traveled, and dividing this difference by the average trip length (expressed in minutes).

### **Transit / Bicycle/Pedestrian / Freight Rail / TDM**

New service for alternative modes supports change in throughput both on the other mode and on highway network. For trips on other modes, estimate total person throughput for existing and new users in the peak period. The person throughput reduction for new users is associated with any throughput savings associated with a shift from auto to the other mode. For the highway network, total demand is reduced, which may lead to a reduction in vehicle demand on parallel facilities. For transit projects, compute the number of equivalent vehicles on roadway(s) within the impacted area using a forecasted 2025 ridership per hour and an assumed transit occupancy. Once the number of vehicles on impacted roadway(s) is computed, determine the peak period person throughput for no-build and build conditions by multiplying an average vehicle occupancy rate by the vehicle throughput.

### **Scoring Value**

Total change in person throughput due to the project.

## *C.2 Person Hours of Delay*

**Definition:** Decrease in the number of peak period person hours of delay in the project corridor.

### **Data Sources/Analytical Tools**

- Latest available 24-hour traffic count data summarized by hour, direction, and roadway segment, including vehicle classification, where applicable, from VDOT TMS, or jurisdiction.
- Latest available regional travel demand model encompassing the influence area only for projects consisting of new location transportation facilities.
- Existing AADT by roadway segment from VDOT TMS or jurisdiction.
- Lane capacity is set by the current functional classification of the roadway. In the case of a new location roadway, the planned functional classification is used. Lane capacities were established based on an average of the capacities outlined in the *ENTRADA User's Guide*, February 2014 and the [Virginia Travel Demand Modeling Policies and Procedures Manual Version 2.0](#).
- For park and ride projects, identify the location of the project using data from the U.S. Census Bureau's OnTheMap tool to query the population within 3 miles of the proposed park and ride improvement. The OnTheMap tool provide data that can be used to determine the average commuting distance and direction for this population.
- For transit projects, Department of Rail and Public Transportation (DRPT) will provide estimated daily ridership and hourly ridership for the proposed service.
- For new managed lane projects, assumed occupancy rates will be provided by VDOT.
- For roadway projects, SPS will be used to determine number of lanes, lane widths, speed limit, terrain (e.g., level, rolling, mountainous), lateral clearance, number of driveways on arterials, interchange density on freeways, and median type on arterials.
- Latest available aerial imagery used to determine merge, diverge, and weaving lengths on freeways and verify other data from SPS.
- FHWA Cap-X: evaluation tool that uses critical lane volumes (CLV) to evaluate the efficiency of intersections and interchanges.
- Potential traffic growth rate sources include VTrans2040, SPS, and travel demand model.
- Highway Capacity Software (HCS) 2010 – Freeway Facilities Module.

- Modified Bureau of Public Roads (BPR) spreadsheet.

### Methodology

The methodology is a quantitative, corridor-based analysis that requires an estimate of future no-build (without project) and build (with project) person throughput and congested travel speeds.

The methodologies to determine person hours of delay for roadway, bicycle/pedestrian, transit, and freight projects are described below, starting with roadway projects. It is anticipated that project corridor length definition will vary by mode and project type. For example, the project length for a park and ride lot project is equal to the average commuting distance determined from the census data website identified in the data sources. On the other hand, the project length for a roadway corridor improvement project is established by extending the corridor to the next adjacent signalized intersection or interchange on both ends of the corridor. If there are no adjacent signalized intersections or interchanges within one mile of the either end of the corridor, then one mile is added to both ends of the corridor.

**Roadway:** There are four types of analyses used to quantify the change in person hours of delay as a result of a proposed roadway project:

- Basic roadway segment (freeway, rural multilane, rural two-lane, urban arterial)
- Freeway facility (diverge, merge, weave),
- Intersection or interchange, and
- New facility.

### Basic Roadway Segment

Basic segments represent uninterrupted-flow conditions and have no fixed causes of delay or interruption external to the traffic stream. This category includes two-lane highways, multilane highways, and basic freeway segments as defined in the *2010 Highway Capacity Manual*. In order to calculate average travel speeds along signalized arterial routes, basic roadway segment sheets are coded along the project length and are combined with the Cap-X analysis to compute the no-build and build average travel speeds.

A modified Bureau of Public Roads (BPR) equation is used for the analysis of these types of facilities. Nationally, the BPR equation is the mostly widely used volume-delay function for road segments. The equation addresses the relationship between volume and capacity on the segment, with the result being the delay associated with traffic volumes. Capacity in the BPR equation is based on functional classification.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using some of the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Collect and document all roadway geometric features using data from SPS and supplemented by field visits and/or aerial imagery.

Step 3: Convert the peak period traffic volumes to flow rates using methods from the *2010 Highway Capacity Manual*.

Step 4: Compute no-build and build travel speeds and delays using a modified BPR equation. Delay is calculated by calculating the difference between the predicted travel speed and the posted speed limit.

Step 5: Compute the change in vehicle hours of delay by subtracting the build (with project) delay from the non-build (without project) delay.

Step 6: Compute the peak period person hours of delay for no-build and build conditions by multiplying an average vehicle occupancy rate by the vehicle delay.

Step 7: Compute the change in person hours of delay by subtracting the build (with project) delay from the non-build (without project) delay.

### **Freeway Facility**

Freeway facilities also represent uninterrupted-flow facilities consisting of continuously connected segments that include: basic freeway, weaving, merge, and diverge segments. The HCS Freeway Facility module is based on *2010 Highway Capacity Manual* procedures.

Step 1: Compute future 2025 peak period no-build and build traffic volumes within the project corridor using the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Compute volume-to-capacity ratio and travel speed using HCS methodologies for no-build and build conditions.

Step 3: Compute no-build and build delay using the travel speed and segment length.

Step 4: Compute the peak period person delay for no-build and build conditions by multiplying the average vehicle delay by an average vehicle occupancy rate by the vehicle delay.

Step 5: Compute the change in person hours of delay by subtracting the build (with project) delay from the non-build (without project) delay.

### **Intersection / Interchange**

Intersections and interchanges represent interrupted flow conditions with features that create delay such as traffic signals. Corridor travel speed and delay will be calculated based on intersection/interchange delay and segment speed

and delay. Apply a capacity check for intersection/interchange and roadway segment. Use the least improved bottleneck to calculate throughput change between the no-build (without project) and the build (with project) conditions.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Determine the critical lane volume for each approach to the intersection, which is defined as the movements with the maximum traffic volume per lane.

Step 3: Use FHWA CAP-X analysis tool to estimate the vehicle delay for the no-build and build conditions.

Step 4: Compute the peak period person delay for no-build and build conditions by multiplying the average vehicle delay by an average vehicle occupancy rate by the vehicle delay.

Step 5: Compute the change in peak period delay by subtracting the build (with project) delay from the non-build (without project) delay.

### **New Roadway Facilities**

Estimating vehicle delay for new facilities requires the use of a regional travel demand model. The project is added to the regional travel demand model and model outputs are then used to summarize project build vehicle delay. The total vehicle delay reduction is the cumulative effect at a system level (total trips).

Step 1: Code the new facility into the regional travel demand model with assumed posted speed limit, facility type, and number of lanes.

Step 2: Identify links in the regional network operating below the speed limit in future no-build scenario with greater than 10% reduction of traffic for the different alternative improvements compared to the no build scenario. Calculate total difference in VHT for these links between the no-build model and the build model.

Step 3: Multiplying the difference between the no-build VHT from the build VHT by 30% to convert to peak period delay reduction (expressed in vehicle hours)

Step 4: Compute the person peak period delay by multiplying the average vehicle delay by an average vehicle occupancy rate.

### **Transit / Freight Rail / TDM**

New service from alternative modes supports change in delay both on the other mode and on the highway network. For trips from other modes, estimate total person travel time savings for existing and new users in the peak hour. The person travel time savings for existing users is associated with any improvement in frequency or travel time associated with the project. The person travel time savings for new users is associated with any travel time savings associated with a

shift from auto to the other mode. For the highway network, total demand is reduced, which may lead to a reduction in delay on parallel facilities.

### **Bicycle/Pedestrian**

No reduction in person hours of delay is assumed for a stand-alone bicycle and/or pedestrian project.

### **Scoring Value**

Total peak-period person delay reduction.

## 8.0 Appendix C: Accessibility Measures

**Table 8.1 Accessibility Factor – Measures Summary**

ID	Measure Name	Weight	Measure Description	Measure Objective
A.1	Access to Jobs	60%	Change in cumulative jobs accessibility within 45 minutes (within 60 minutes for transit projects)	Measure assesses the change in cumulative access to employment opportunities as a result of project implementation based on the GIS accessibility tool.
A.2	Access to Jobs for Disadvantaged Populations	20%	Change in cumulative job accessibility for disadvantaged populations and accessibility within 45 minutes (within 60 minutes for transit projects)	Measure assesses the change in existing cumulative access to employment opportunities as a result of project implementation based on the GIS accessibility tool.
A.3	Access to Multimodal Choices	20%	Assessment of the project support for connections between modes, and promotion of multiple transportation choices	Measure assigns more points for projects that enhance interconnections among modes, provide accessible and reliable transportation for all users, encourage travel demand management, and potential to support emergency mobility.

### Measures Approach

#### A.1 Access to Jobs

**Definition:** The GIS accessibility tool reports the existing cumulative accessibility to jobs within 45 minutes at the individual U.S. Census block group level statewide. For transit projects, accessibility will be calculated to jobs within 60 minutes. The tool is capable of calculating the cumulative accessibility to jobs by mode (auto, transit, pedestrian and bicycle). The jobs are weighted based on a travel time decay function, where jobs within a shorter travel time are weighted more than jobs farther away. The decay function was developed based on travel survey data. The cumulative accessibility represents the total number of jobs reachable in a 45 minute travel time from each block group to every other block group within an area of influence of a particular project.<sup>5</sup>

The tool calculates the improvement in number of jobs reachable within that travel shed resulting from a proposed transportation improvement. Therefore, the cumulative number of jobs in a region is a composite number based on total

<sup>5</sup> The area of influence of a project is defined as a 45 minute radius circle around the project. Beyond this area of influence, the tool does not calculate job accessibility as it is a distance that is not relevant to the vast majority of trips.



jobs accessible from each block group to every other block group and can be a very high number, especially for the auto travel mode. The actual metric relevant for SMART SCALE prioritization purposes is the increase in cumulative job accessibility resulting from a proposed project. Travel times are based on congested roadway travel times and real transit operating schedules.

As part of the estimation of change in project corridor person hours of delay (Measure C.2), an estimate of the project build congested speed will also be developed. The project build congested speed is entered into the underlying congested network within the accessibility tool, and the difference between the build and no build congested speeds is used to calculate the change in cumulative accessibility by block group.

#### **Data Source(s)**

- Accessibility tool.
- Change in project corridor congested speed or transit operations.

#### **Methodology**

The accessibility tool currently reports a cumulative accessibility to jobs by mode for each block group in Virginia. The analysis of project benefits considers how an improvement in travel time expands accessibility to jobs at the block group level (without consideration of regional or State boundaries). By default, current land use forecasts will be used. Applicants may also provide modified land use density assumptions from a locally or regionally approved market study to be used for Build versus No-Build analysis.

Step 1: Update congested roadway speeds or transit network. Based on analysis conducted in the congestion factor for measure C.2, post-project implementation congested speeds are generated and applied to the roadway network underlying the accessibility tool. For transit projects, the project corridor and basic operational information (peak period frequency and travel times) are coded into the transit network (based on General Transit Feed Specification (GTFS) data, which is a common format for public transportation schedules and associated geographic information) underlying the accessibility tool.

Step 2: Use the accessibility tool to calculate the current (no build) accessibility by mode for a project. The accessibility is the cumulative access to jobs from each block group to every other block group in a 45 minute travel time within the project's area of influence (60 minutes for transit projects).

Step 3: Use the accessibility tool to calculate the build accessibility (using post-project implementation congested speeds) by mode for a project.

Step 4: Calculate the change in accessibility scores between the build and no build conditions. For each project, a cumulative accessibility improvement is reported (depending on mode, e.g., for roadway projects the auto mode improvement is reported, for transit projects the transit mode improvement is



reported, for multimodal projects the cumulative multimodal improvement is reported).

### Scoring Value

Total change in cumulative jobs accessibility.

## *A.2 Access to Jobs for Disadvantaged Populations*

**Definition:** The accessibility tool (currently in pilot testing) reports the existing cumulative accessibility to jobs within 45 minutes at the individual U.S. Census block group level statewide. For transit projects, accessibility will be calculated to jobs within 60 minutes. The tool is capable of calculating the cumulative accessibility to jobs by mode (auto, transit, pedestrian). The jobs are weighted based on a travel time decay function, where jobs within a shorter travel time are weighted more than jobs farther away. The decay function was developed based on travel survey data. The cumulative accessibility represents the total number of jobs reachable in a 45 minute travel time from each block group to every other block group within an area of influence of a particular project<sup>6</sup>. For this measure, the change in cumulative job accessibility is summed for Census block groups having a share of disadvantaged population that is significantly above the regional average.

### Data Source(s)

- Accessibility tool.
- 2013 U.S. Census American Community Survey 5-year estimates.

### Methodology

For the purposes of this analysis, “disadvantaged population” is calculated as having a regionally-significant share of low-income, minority, or limited-English proficiency (LEP) population. To calculate which Census tracts could be classified as “disadvantaged,” the following steps were taken:

- Obtained Virginia census tract data from American Community Survey (5 year sample) for population by income, minority, and LEP.
- Grouped all the tracts by county/city/PDC and developed PDC averages for the share of population by tract for each disadvantaged population group.
- Identified tracts for each category that exceeded the 75th percentile share.
- Identified “disadvantaged” tracts as those that had at least one category over the 75th percentile share.

All Census tracts in Virginia were analyzed to determine which tracts had “regionally significantly” populations of low-income minority, or limited English speaking persons (LEP), using the 75th percentile of the Planning Development Commission (PDC) averages.

For instance, a Census tract within Augusta County would be considered to have a “regionally significant low-income population” if the tract’s share of low-income population (from the 2010 Census American Fact Finder – 15.1%) was higher than the 75th percentile of the Central Shenandoah PDC (12.3%). If a Census tract was found to be “regionally significant” in at least one of the three topics (low-income, minority, or LEP), the tract was characterized as “disadvantaged.”

The accessibility tool calculates job accessibility by Census block group so the block group would be flagged as “disadvantaged” based on the Census tract where it is located. The change in cumulative job accessibility is summed for Census block groups having a “regionally-significant” share of at least one of the disadvantaged population groups.

### **Scoring Value**

Total change in cumulative jobs accessibility for areas that are identified as having a regionally-significant share of disadvantaged populations.

### *A.3 Access to Multimodal Choices*

**Definition:** This measure considers the relationship of the project corridor (based on proximity to other modes and sponsor input on project definition) to alternative transportation modes, and the quality of those modes. The objective is to recognize projects that enhance connections between modes or create new connections.

#### **Data Source(s)**

- GIS data of transit routes or transit service areas, all rail transit stations (from GTFS data as described for accessibility tool).
- DRPT/VDOT GIS data of park-and-ride lots.
- VDOT GIS data of on and off-road bicycle facilities (incomplete dataset at this time).

## Methodology

Step 1: The project sponsor provides project level detail on the extent of connections and accommodation of multiple modes as part of the project definition and self assign points in consistent with descriptions in Table 8.2.

Step 2: The project corridor is entered into a GIS database and overlaid with a layer including all multimodal transportation options. The GIS analysis is recommended to inform the validation of sponsor scoring in Table 8.2.

For roadway or multimodal projects this includes: type of bicycle facility, type of pedestrian facilities, connection to park-and-ride locations or inclusion of managed lanes, inclusion of technology supporting traveler information, or wayfinding signage to other modes, and accommodation of on-road transit vehicles.

For transit projects, depending on transit mode, this includes: associated bike and pedestrian facilities, bicycle parking, accommodation of bike on transit vehicles, park-and-ride facilities, traveler information, affiliation or presence of local TDM programs, and transfers with other transit modes.

For bike and pedestrian projects, this includes: class of bicycle facility, type of pedestrian improvements, connections to other on- or off-road bicycle facilities, connections to transit facilities, and affiliation or presence of local TDM programs. A bicycle facility project can include elements in one or more of the following categories:

- On-Street Facilities: Shared use paths, separated bicycle lanes (cycle tracks), buffered bicycle lanes, conventional bicycle lanes, bicycle boulevards (signed routes) and shared roadways.
- Off-Street Facilities: Off-street bicycle facilities are separate from motor-vehicle roadways and include shared use paths or trails. Trails may be adjacent to the roadway or located on an abandoned railroad right of way (ROW).
- Equipment: Bicycle facility equipment includes signs, traffic signals, barriers, and bicycle parking.

Freight related accessibility is considered in the economic development factor.

Step 3: SMART SCALE review staff evaluate project scoring and work with project sponsor to adjust scoring as necessary.

## Scoring Value

Total project points are then multiplied (scaled) by the number of peak period non-SOV users.

**Table 8.2 Access to Multimodal Choices – Scoring Approach**

<b>Project Type (Mode) and Characteristics</b>	<b>Points (If Yes)</b>
Project includes transit system improvements or reduces delay on a roadway with scheduled peak service of 1 transit vehicle per hour.	5
Project includes improvements to an existing or proposed park-and-ride lot. Ex. New lot, more spaces, entrance/exit, technology (payment, traveler information).	4
Project includes improvements to existing or new HOV/HOT lanes or ramps to HOV/HOT	2
Project includes construction or replacement of bike facilities. For bicycle projects, off-road or on-road buffered or clearly delineated facilities are required.	1.5
Project includes construction or replacement of pedestrian facilities. For pedestrian projects, sidewalks, pedestrian signals, marked crosswalks, refuge islands, and other treatments are required (as appropriate).	1.5
Project provides real-time traveler information or wayfinding specifically for intermodal connections (access to transit station or park&ride lot).	1
Provides traveler information or is directly linked to an existing TMC network/ITS architecture.	1
<b>Total Points Possible</b>	<b>5 points maximum</b>
Measure Scaling: Points are multiplied by the number of new peak period non-SOV users	

## 9.0 Appendix D: Environmental Quality Measures

**Table 9.1 Environmental Quality Factor – Measures Summary**

ID	Measure Name	Weight	Measure Description	Measure Objective
E.1	Air Quality and Energy Environmental Effect	50%	Potential of project to improve air quality and reduce greenhouse gas emissions	Measure rates a project's potential benefit to air quality and ability to increase energy efficiency or alternative energy use weighted by the total number of users served.
E.2	Impact to Natural and Cultural Resources	50%	Potential of project to minimize impact on natural and cultural resources located within project buffer	Measure evaluates how much sensitive land would be affected within project buffer around the project, and rates projects highest that have minimal or no impacts and are providing benefits in other factor areas.

### Measures Approach

#### *E.1 Air Quality and Energy Environmental Effect*

##### Definition

The Air Quality and Energy Environmental Effect measure describes the level of benefit that a project is projected to have on air quality and greenhouse gas emissions (or alternative energy use). The objective of this measure is to recognize projects that are expected to contribute to improvements in air quality and reductions in greenhouse gas emissions.

##### Data Source(s)

- Project sponsor answers defined qualifiers as described below based on project definition.
- Total project corridor passenger throughput (as determined in the congestion factor).

##### Methodology

Air quality and energy effect is determined by reviewing a project sponsor responses (collected through the project nomination) to the qualifications identified in Table 9.2. The methodology applies to all project types.

Step 1: The project sponsor self assesses the project based on Table 9.2 (10 point potential maximum). The nomination form includes space for the sponsor to provide clarifications/justifications for the points awarded.

Step 2: SMART SCALE review staff receive each project nomination and reviews the information provided. As appropriate, staff contact project sponsors to address any questions or unexplained scoring.

**Table 9.2 E.1 Air Quality and Energy Environmental Effect – Scoring Approach**

Project Type (Mode) and Characteristics	Points (If Yes)
<b>Non-SOV Project Characteristics</b>	
Project includes improvements to rail transit or passenger rail facilities.*	3
Project includes construction or replacement of bike facilities. For bicycle projects, off-road or on-road buffered or clearly delineated facilities are required.*	2
Project includes construction or replacement of pedestrian facilities. For pedestrian projects, sidewalks, pedestrian signals, marked crosswalks, refuge islands, and other treatments are required (as appropriate).*	2
Project includes improvements to an existing or proposed park-and-ride lot. Ex. New lot, more spaces, entrance/exit, technology (payment, traveler information).*	2
Project includes bus facility improvements or reduces delay on a roadway with scheduled peak service of 1 transit vehicle per hour.*	1
Project include special accommodations for hybrid or electric vehicles, or space or infrastructure for electric vehicle parking/charging).*	0.5
Project includes energy efficient infrastructure or fleets, including: hybrid or electric buses, electronic/open road tolling, alternative energy infrastructure (e.g., roadside solar panels).*	0.5
<b>Total Points Possible</b>	<b>8.5 points maximum*</b>
Measure Scaling: *Points are multiplied by the number of peak period non-SOV users.	
<b>Freight Transportation Project Characteristics</b>	
	<b>Points (If Yes)</b>
Project reduces traffic delay at a congested intersection, interchange, or other bottleneck with a high percentage of truck traffic (greater than 8 percent of AADT). ***	1
Project includes improvements to freight rail network or intermodal (truck to rail) facilities/ports/terminals.**	0.5
<b>Total Points Possible</b>	<b>1.5 points maximum**</b>
Measure Scaling: **Points are multiplied by peak period truck volumes ** Points awarded for projects with a decrease in person hour delay greater than zero and with truck traffic greater than 8% AADT	

## Scoring Value

After SMART SCALE staff review and confirm points assigned in Table 9.2. The maximum total points for each category (non-SOV and trucks) are multiplied by the respective scaling value (non-SOV users and peak period truck volume).

### *E.2 Impact to Natural and Cultural Resources*

**Definition:** This measure considers the potential of a project to minimize the impact on natural and cultural resources located within the project buffer.

#### **Data Source(s)**

GIS layers for each of four categories. For cultural resources, associated non-spatial data (“Property Evaluation Status” or “Site Evaluation Status”) will be used to determine eligibility for listing in the National Register of Historic Places. For threatened and endangered species, species status will be referenced to appropriately filter the spatial data and is limited to state endangered, state threatened, federal endangered, federal threatened.

#### **Methodology**

The potential of the project to minimize impact on natural and cultural resources is conducted by considering the existing acres of sensitive areas and resources located within a ¼ mile buffer around the project, as well as the type of environmental document (EIS, EA, CE) expected to be required for the project. The final E.2 (Natural and Cultural Resource Impact) score for the project will be based on the portion of acres affected relative to the total project buffer (initial score) and the weighted points derived from other factor areas. The resulting value is then renormalized to calculate the final score and weighting is applied. Measure E.2 is unique among evaluation measures because the score is adjusted, or scaled, by the benefit scores for all other measures.

Step 1: Using a ¼ mile buffer around each project, total the acreage of land in four categories – 1) Conservation Land, 2) Species/Habitat, 3) Cultural Resources, and 4) Wetlands. The specific GIS layers used in each category are as follows:

#### Conservation Lands

- Virginia Outdoor Foundation Protected Easements
- Virginia Department of Conservation and Recreation 6F properties
- Virginia Department of Conservation and Recreation Conservation Lands
- Virginia Department of Forestry Agricultural/Forest Districts
- Virginia Department of Historic Resources Protected Easements

#### Species/Habitat

- Virginia Department of Game and Inland Fisheries Threatened and Endangered Species

- Virginia Center for Conservation Biology (Eagles)

#### Cultural Resources

- National Park Service, American Battlefield Protection Program Potential National Register (POTNR) Areas
- Virginia Department of Historic Resources Architecture layer: properties listed in, or determined eligible for listing in the National Register of Historic Places (“Evaluation Status”)
- Virginia Department of Historic Resources Archeology layer: sites listed in, or determined eligible for listing in the National Register of Historic Places

#### Wetlands

- U.S. Fish and Wildlife Service National Wetlands Inventory

Step 2: Determine the level of environmental documentation required for the federal action. This information will be used to assess and scale the potential natural resource impacts. If not already determined by the appropriate federal agency with the action, VDOT/DRPT environmental staff will determine the anticipated level of environmental documentation required for the project using the best available information. Concurrence by the federal agency is required prior to initiation of environmental documentation. The amount of potentially impacted acreage that will be counted towards the score is different based on the type of environmental document required:

- *Environmental Impact Statement* – 50% of acreage will be used for scoring –
- *Environmental Assessment* – 30% of acreage will be used for scoring
- *Categorical Exclusion* – 10% of acreage will be used for scoring

This process of scaling acres based on the type of environmental document is illustrated in Table 9.4 below.

**Table 9.3 Example of Potentially Impacted Acres by Type of Environmental Document**

Project	Conservation	Species/ Habitat	Cultural Resources	Wetlands	Total Acres	Environmental Document	Acres Counted	Buffer Acres	Buffer Ratio
A	100	25	25	150	300	EA	100	500	0.2
B	100	25	25	150	300	EIS	150	500	0.3
C	20	0	0	5	25	CE	2.5	500	0.005

Step 3: Divide the amount of potentially impacted acres by the total buffer area in acres. This is the ratio of potentially impacted area.



Step 4: The impacted areas buffer ratio is normalized on a 0 to 100 scale, with the projects having zero acreage potentially impacted receiving 100 points, the project with the lowest non-zero acreage potentially impacted receiving 95 points, and the project having the greatest impacted acres assigned 0 points. All other values are scored on a straight line between 0 and 95. The second highest score was set at 95, and not relative to 100, to reflect the greater benefit of having no impacts compared with a small amount of acres impacted. **Scoring Value**

The final score is assigned by scaling the Natural and Cultural Resource Impact (E.2) score based on benefits in other categories. The steps in this re-scaling process are the following:

1. Initial E.2 measure score is calculated from acres impacted and placed on a 0 to 100 scale as described in Step 4 above.
2. Scores are scaled by the weighted scores of all the other measures.

$$S_{E2} = \sum S_{Weighted} * \frac{S_{E2,Initial}}{100}$$

where

$S_{E2}$  Final Natural and Cultural Resource Impact score

$\sum S_{Weighted}$  Sum of the weighted scores for all other measures

$S_{E2,Initial}$  Initial score, Natural and Cultural Resource Impact E.2

3. Normalized Natural and Cultural Resource Impact (E.2) scores are calculated by dividing each Scaled Graduated score by the highest Scaled Graduated score.
4. Finally, each Weighted Natural and Cultural Resource Impact (E.2) Score is calculated by multiplying each Normalized Environmental Impact score by 5%. (Environmental Factor is weighted 10% statewide and Natural and Cultural Resource Impact Measure is 50% of Environmental score).

An example of how this adjustment works is shown below in the table. In the example, project A has a lower initial score (80) on E.2 than project C (90). However, project A has more benefit (higher score) in all of the other measures with 48 points, compared with project C with 32 points. When the E.2 score is adjusted and normalized to account for benefits in other factor areas, project A results in a final E.2 score with a 5, while project C has a final E.2 score of 3.75.

**Table 9.4: Example of Scaling the E.2 Based on Scores in Other Factor Areas**

Project	Initial E.2 Score Based on Acres Impacted	Factor Area Scores						Sum Weighted Scores (without E.2)	E.2 Scaled by Factor Area Scores	Normalized Final E.2 Score	Weighted E.2 Score
		Safety	Congestion	Access.	Econ. Develop.	Land Use	E.1 Score				
A	80	10	18	10	5	3	2	48	38.4	100.0	5.00
B	30	10	18	10	5	3	2	48	14.4	37.5	1.88
C	90	15	4	5	5	1	2	32	28.8	75.0	3.75
D	5	15	4	5	5	1	2	32	1.6	4.17	0.21

# 10.0 Appendix E: Economic Development Measures

**Table 10.1: Economic Development Factor – Measures Summary**

ID	Measure Name	Weight	Measure Description	Measure Objective
ED.1	Project Support for Economic Development	60%	Project consistency with regional and local economic development plans and policies and support for local development activity	The intent of this measure is to assess if the project is supporting new and existing economic development and the progress made toward development in the project corridor at the local level. Progress will be assessed through use of a checklist of desired actions.
ED.2	Intermodal Access and Efficiency	20%	Rate projects based on the extent to which the project is deemed to enhance access to critical intermodal locations, interregional freight movement, and/or freight intensive industries.	<p>The intent of this measure is to assess the:</p> <p>Level to which the project enhances access to distribution centers, intermodal facilities, manufacturing industries or other freight intensive industries;</p> <p>Level to which the project supports enhanced efficiency on a primary truck freight route (or high volume/ high value truck or rail freight corridor);</p> <p>Level to which the project enhances access or reduces congestion at or adjacent to VA ports/ airports</p>
ED.3	Travel Time Reliability	20%	Improvement in travel time reliability attributed to the project	The intent of this measure is to determine the project's expected impact on improving reliability which supports efforts to retain businesses and increase and economic activity.

## Measures Approach

### *ED.1 Project Support for Economic Development*

**Definition:** Assessment of project based on sponsor input regarding the project support of economic development priorities as stated in jurisdiction/ MPO/PDC/other regional plans; as well as steps achieved toward specific developments, including utility provisions for specific economic development sites supported by the project. Progress will be assessed through use of a checklist of desired actions.

**Data Sources:** Project description and supporting information provided by the project sponsor.

**Methodology:** The focus of this measure is on project consistency/support of local/county/PDC/regional economic development plans and support of real, planned non-residential development (residential only developments are not considered) within the project corridor (what is included in the project corridor is clarified in steps below). Project assessment is based on the use of a checklist, which is shown in Table 10.2 below. Validation (a brief narrative) of the existence of the actions in the checklist is included as part of the project nomination. The project would be awarded up to 1 point for each question below, points are summed. Detail to support development of a response to each question follows Table 10.2.

**Table 10.2: ED.1 - Project Support for Economic Development – Scoring Approach**

Rating Description	Points Value
Transportation project consistency with local Comprehensive Plan or local Economic Development Strategy	Consistent with: 0.5 Referenced in: 1
Transportation project consistency with Regional Economic Development Strategy	Consistent with: 0.5 Referenced in: 1
Development project consistent with local comprehensive plan's (future land use or zoning map, and or zoning code/ordinance)	Consistent with: 0.5 Referenced in: 1
Development project site plan status	Submitted: 0.5 Approved: 1
Development project site utilities status (sewer/water, broadband, etc...)	Programmed: 0.5 In place: 1
<b>Total (maximum points in rows above)</b>	<b>5</b>
Measure Scaling: Points are multiplied by development building square footage (does not include residential-only property) near the project. The project improvement type dictates the buffer allowed (refer to Table 10.3). Square footage is discounted by the following:	
Project provides primary access to the site or is adjacent to the site	100% of sq. footage
Project enhances access in the vicinity of the site but is not physically adjacent	50% of sq. footage
*Zoned sites that do not receive any points under site plan status or site utility status (i.e. zoned only) will not be awarded 0.5 or 1 point for consistency with local comprehensive plans. To receive these points the project must receive, at a minimum, 0.5 points from site plan status and/or site utility status.	

### Guidance for Questions 1-5:

**Question 1 guidance:** To determine whether a project is consistent with local Comprehensive Plan or local Economic Development Strategy, the project sponsor should conduct the following steps:

Step 1: Identify the local Comprehensive Plan or local Economic Development Strategy for the geographic area in which the transportation project is proposed

(the strategy or goals may be found in a stand-alone document or as part of another document, such as a comprehensive plan).

Step 2: Review the goals, objectives and strategies noted in the document(s).

Step 3: Review the document to determine if the proposed transportation project is specifically cited in the document(s) as a key project desired to support local/regional economic development.

Step 4: Award points to the proposed project as follows:

- If the proposed transportation project is specifically mentioned as a key project in at least one of the local Comprehensive Plan or local Economic Development Strategy documents, the project is considered “referenced in,” and is awarded 1 pt.
- If the proposed transportation project clearly supports an economic development objective or strategy, that project is considered “consistent” and is awarded 0.5 pts.

**Question 2 guidance:** To determine whether a project is consistent with the Regional Economic Development Strategy, the project sponsor should conduct the following steps:

Step 1: Identify the Regional Economic Development Strategy for the geographic area in which the transportation project is proposed (the strategy or goals may be found in a stand-alone document or as part of another document).

Step 2: Review the goals, objectives and strategies noted in the document(s).

Step 3: Review the document to determine if the proposed transportation project is specifically cited in the document(s) as a key project desired to support local/regional economic development.

Step 4: Award points to the proposed project as follows:

- If the proposed transportation project is specifically mentioned as a key project in the Regional Economic Development Strategy, the project is considered “referenced in,” and is awarded 1 pt.
- If the proposed transportation project clearly supports an economic development objective or strategy, that project is considered “consistent” and is awarded 0.5 pts.

**Question 3 guidance:** To determine whether each development site (do not include residential only developments) within the project corridor (1 mile buffer) is consistent with the local Comprehensive Plan future land use or zoning map, and or zoning code/ordinance, the project sponsor should conduct the following steps:

Step 1: Identify the local Comprehensive Plan future land use or zoning map, and the zoning code/ordinance for the geographic area in which the transportation project is proposed.

Step 2: Review future land use or zoning map and or zoning code/ordinance for the project area.

Step 3: List each development site within 1 mile of the project corridor (do not include residential only developments) and for each, provide the projected square footage and distance from the project corridor.

Step 4: Award points to the proposed project as follows<sup>7</sup>:

- If the development project is specifically mentioned as a key project in the local comprehensive plan, the project is awarded 1 pt.
- If the development project is considered “consistent” with the local comprehensive plan (future land use or zoning map) and or zoning code/ordinance, it is awarded 0.5 pts.

**Question 4 Guidance:** To assess each development project’s site plan status, review the jurisdiction information regarding development review and approval of development projects adjacent to the project corridor (for the same set of development projects identified in Question 3).

- If the site plan has been “approved,” (or the equivalent, dependent upon local terminology), by the jurisdiction, the project should be awarded 1 point.
- If the site plan has the status of “submitted,” the project receives 0.5 points.

**Question 5 Guidance:** To assess each development project site’s utility provision status (for the same set of development projects identified in Question 3), the local jurisdiction information regarding utility systems and provision, including current and planned utilities, should be reviewed.

- If the development project site has utilities (sewer/water, broadband, etc...) that have been programmed, the project receives 0.5 points.
- If the development project site has utilities (sewer/water, broadband, etc...) that are in place, the project receives 1 point.

### Scoring Value

The total points from Table 10.2 above are multiplied (scaled) by the proposed or projected square footage of each development to reflect the magnitude of the development supported by the transportation project.

Measure Scaling: Points are multiplied by the proposed or potential development building square footage (does not include residential-only property) near the project.

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<sup>7</sup> For zoned only properties (ie. no submitted or approved site plan and no utilities in place or programmed) the site will receive no points (0.5 or 1 point) for zoning per CTB direction.

**Step 1:** Award Points to each development using the checklist in Table 10.2. (ED.1 Economic Development Support – Scoring Approach)

**Step 2:** Determine total square footage: acquire the proposed or potential development building square footage (does not include residential-only property) within a buffer distance from the project, depending on project type, as defined in Table 10.3.

**Step 3:** Next adjust for provision of access as shown in Table 10.3 below for each site within the buffer distance to calculate the adjusted square footage value.

**Table 10.3 Buffer Distance by Project Type and Adjustment for Provision of Access**

Buffer Distance to Determine Total Square Footage	Applicable Project Types
Tier 1 Project Type – 1 mile buffer	Turn Lane, Intelligent Transportation Systems, Bike Lane or Path, Sidewalk, Bus Stop, Park & Ride Lot
Tier 2 Project Type – 3 mile buffer	Access Management, Signal optimization, Increase Bus service, Improvement to Rail Transit Station
Tier 3 Project Type – 5 mile buffer	New through lane, new/improved interchange, new bridge, new Rail Transit Station, additional Rail Track
Access Provision Adjustment per Site within Buffer	
Project provides new direct access to the site or improves existing access to the site (site must be physically adjacent to the project)	Project enhances economic development by improving congestion, mobility, access, or operations in the vicinity of the site but the site is not physically adjacent to the project
Multiply by 1	Multiply by 0.5

See the example in Table 10.4 for illustration of this calculation in Step 2 and Step 3 for a Tier 1 project example.

**Table 10.4 Sample Calculation for Adjusting Square Footage of Development**

Project Type	Development Square Footage (within 1 mile buffer)	Project provides direct access (Yes = 1, No =0.5)	Adjusted Square footage value	Distance (divide if greater than 1 mile)	Final Adjusted Square footage value
Bike Path (Tier 1)	40,000	1	40,000	1	40,000
	150,000	0.5	75,000	2	37,500
	500,000	0.5	250,000	1.5	166,667

	25,000	1	25,000	2	12,500
	10,000	1	10,000	1	10,000
<b>TOTAL</b>	<b>725,000</b>		<b>400,000</b>		<b>266,667</b>

**Step 4:** Next, results of Step 3 are adjusted for distance from the project:

For any development sites that are greater than 1 mile away, the adjusted square footage value must be divided by the distance in miles.

**Step 5:** Finally, the points awarded in Step 1 are factored by the adjusted square footage value to obtain the project score.

## *ED.2 Intermodal Access and Efficiency*

**Definition:** Measure rates each project based on the extent to which the project is deemed to enhance access to critical intermodal locations and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors.

### **Data Sources:**

- Project description and supporting information provided by project sponsor
- Project description, if applicable, in the Virginia Multimodal Freight Study (2014)
- STAA Truck Routes and Restrictions<sup>8</sup>

### **Methodology**

Project descriptions will be reviewed and assessed based on the extent to which the project is deemed to enhance access to critical intermodal locations and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors.

Points are assigned through a qualitative assessment of the project description and supplementary information submitted by the project sponsor. Flexibility is provided in the project nomination for sponsors to describe the manner in which the project is expected to enhance access to critical intermodal locations, interregional freight movement, and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors. The project rating is based on the extent to which the project is deemed to enhance access to critical intermodal locations, freight networks, and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors.

<sup>8</sup> <http://gis.vdot.virginia.gov/vatruckweb/VaTruckRestrictions.aspx>



This comparison supports a determination of the level of economic enhancement on a 0 to 6 scale as summarized in Table 10.5.

**Table 10.5 Intermodal Access and Efficiency – Scoring Approach**

Rating Description	Value
<b>1. Level to which the project enhances access to existing or planned distribution centers, intermodal transfer facilities (excluding ports and airports), manufacturing industries or other freight intensive industries</b>	
Project provides direct access (within 1 mile) to existing or planned locations	2
Project provides indirect access (greater than 1 mile, less than 3 miles) to existing or planned locations	1
No direct or indirect access	0
<b>2. Level which the project supports enhanced efficiency on a primary truck freight route</b>	
Project is on the designated STAA National and Virginia Network or a STAA Virginia Access Route <sup>9</sup>	2
Project directly connects to designated STAA National and Virginia Network or a STAA Virginia Access Routes	1
Project is not on and does not connect to the designated STAA National and Virginia Network	0
<b>3. Level to which the project enhances access or reduces congestion at or adjacent to Virginia ports or airports</b>	
Project provides direct access to (within 1 mile) existing or planned ports or airports (measured from designated entry gates to port or air cargo facilities)	2
Project provides indirect access to (greater than 1 mile, less than 3 miles) existing or planned ports or airports (measured from designated entry gates to port or air cargo facilities)	1
No direct or indirect access	0
<b>Total (sum of score)</b>	<b>0 – 6</b>

### Scoring Value

Total points received based on the assessment in Table 10.7 are multiplied (scaled) by total freight tonnage within the project corridor. Depending on the project type, the definition of total freight tonnage within the project corridor will vary. For example, for an interchange project or extension of acceleration/deceleration lanes at an interchange, estimates of freight tonnage on the ramps (instead of the mainline) will be used to scale the points received as described in Table 10.7.

### ED.3 Travel Time Reliability

**Definition:** Change in travel time reliability attributed to the project.

#### Data Source(s)

- Latest five complete years of crashes from VDOT Roadway Network System (RNS) GIS data maintained by Traffic Engineering Division.

<sup>9</sup> <http://gis.vdot.virginia.gov/vatruckweb/VaTruckRestrictions.aspx>

- Buffer index (BI) from I-95 Corridor Coalition/University of Maryland Regional Integrated Transportation Information System (RITIS).
- Weather information from VDOT VA Traffic database.
- AASHTO *Highway Safety Manual* (HSM), 2010.

### Methodology

The methodology to compute travel time reliability for a project is a quantitative, corridor-based analysis with two components: impact and frequency. Impact is defined as the ability of a project to reduce the impact of the four contributors for unreliable travel time:

- Highway incidents
- Weather events
- Work zones
- Capacity bottlenecks

Since other SMART SCALE measures account for the impacts of work zones and capacity bottlenecks, only the impacts of highway incidents and weather events will be accounted for in the computation of travel time reliability.

Frequency is defined as the likelihood of unanticipated delays due to highway incidents and weather events. Estimates of frequency are based on segment data for incidents and weather.

For each project, VDOT will compile information to compute five factors to be used in evaluating the reliability of the proposed project:

- Buffer index (BI)
- Incident impact
- Incident frequency
- Weather impact
- Weather frequency

The buffer index is defined as the extra time travelers should add to average travel times to ensure on-time arrival. This index is expressed as a percentage of the average time. A buffer index of 0.20 means that a travelers needs to increase their time cushion by an extra 20% from the average travel time. This index value is computed by dividing the difference between the 95th percentile travel time and mean travel time by the mean travel time for a segment. For long corridors, the index is averaged using a weighted factor based on VMT.

The buffer index which comes from the RITIS data does not provide statewide coverage. In the first round of SMART SCALE scoring, in cases where data does not exist, the method utilized buffer indices from other nearby facilities. This approach leads to questionable results on low volume roadways. Moving

forward, if buffer index data does not exist within the project corridor, the approach is to assume there is no reliability issue and  $BI = 0$  - therefore the score will be 0.

The methodology to compute travel time reliability for roadway projects is defined in the following steps:

**Step 1: Determine the impact of incidents on the network.** The effectiveness of the project to reduce the impact of incidents within the project study area will be based on the type of project. Table 1 present the impact values of both roadway and transit projects. Project types that are most effective at reducing the impacts of incidents will receive the highest scores as identified in the following scoring criteria:

- 2: Projects directly improving incident frequency and duration (e.g., interchange improvements, truck run-away ramps, queue warning)
- 1: Projects improving incident management response (e.g., traveler information systems, location signs, reversible lanes)
- 0: No impact

While most projects provide one benefit in incident reduction per the project type listed in Table 1, there are complex projects that provide more than one benefit. For those projects, the total score of the impact of incidents is found by adding the maximum value of one benefit (i.e., 1 or 2) to 10% of the value of the remaining benefits. For example, if a project adds a travel lane and a truck runaway ramp, its score is  $2 \text{ (travel lane)} + 10\% \times 2 \text{ (truck runaway ramp)} = 2.2$

**Step 2: Determine the frequency of crashes using historical crash data.** VDOT will compile the latest 5 years of crashes within the project limits. An annual average Equivalent Property Damage Only (EPDO) value is obtained through data from the VDOT Roadway Network System and the ratio of cost for crashes by severity published by FHWA and AASHTO since the EPDO value is used as a measure to quantify the incident duration and the impact to travel time reliability, the weight for Fatal crashes is adjusted from 540 to 120 to better reflect the incident duration as opposed to the societal cost as applied in the EPDO calculation for the safety measures. EPDO will be used as a surrogate measure to determine the frequency and duration of incidents, since more severe crashes will typically cause a longer traffic disruption. The EPDO equates injury and fatal crashes to property damage only crashes, thus reflecting the severity. Project types that are most effective at reducing the frequency and severity of incidents will receive the highest scores as identified in the following scoring criteria:

- 5: EPDO greater than 300
- 4: EPDO between 200 and 300
- 3: EPDO between 125 and 200
- 2: EPDO between 75 and 125

- 1: EPDO between 25 and 75
- 0: EPDO less than 25

**Step 3: Determine the impact of weather events.** The effectiveness of the project to reduce the impact of weather within the project study area will be based on the type of project. Project types that are most effective at reducing the impacts of weather will receive the highest scores as identified in the following scoring criteria:

- 2: Projects directly mitigate weather impacts by geometric improvements or end-to-end detection or warning systems
- 1: Projects that contain a component of an end-to-end detection or warning system or mitigate the event (e.g., improved detour routes, expanded transit operations)
- 0: No impact

While most projects provide one benefit in mitigating weather events per the project type listed in Table 1, there are complex projects that provide more than one benefit. For those projects, the total score of the impact of weather events is found by adding the maximum value of one benefit (i.e., 1 or 2) to 10% of the value of the remaining benefits. For example, if a project adds a bridge heating system and a reversible lane, its score is 2 (bridge heating system) + 10% x 1 (reversible lane) = 2.1

**Step 4: Determine the frequency of weather events using historical weather data.** VDOT will compile 3 years historical weather data within the project limits. The magnitude of weather events will be determined from historical data and scores will be assigned according to the following criteria:

- 2: More than 40 hours of combined moderate/severe snow events and flood events per year
- 1: Between 20 and 40 hours of combined moderate/severe snow events and flood events per year
- 0: Less than 20 hours of combined moderate/severe snow events and flood events per year

**Step 5: Compute the buffer index of the roadway.** The Regional Integrated Travel Information System (RITIS), offered through VDOT's participation with the I-95 Corridor Coalition provides a tool to calculate the buffer index. The RITIS system can provide the buffer index for all interstates and most primary routes. Where buffer index data is not available it can be assumed that the buffer index is zero if no congestion or reliability issues are observed.

**Step 6: Compute the travel time reliability measure.** To compute travel time reliability, add the product of the incident impact (from Step 1) and the incident frequency (from Step 2) to the product of the weather impact (from Step 3) and

the weather frequency (from Step 4), then multiply this result by the buffer index (from Step 5).

The methodology to determine travel time reliability for transit, and TDM (including park and ride lots) use this defined process as they are include as project impacts in Table 10.8. Bicycle/pedestrian projects are not applicable.

### **Scoring Value**

The travel time reliability measure estimated in Step 6 above is multiplied by corridor VMT to scale the scoring results.

**Table 10.6 Incident, Weather and Work Zone Impact Scoring**

Major Project Type	Sub Project Type	Incidents Impact	Weather Impact
Median Design	Emergency crossovers, Controlled/Gated turnaround	2	1
	Moveable traffic barriers	0	1
	Movable cable median barrier	1	1
	High median barriers	1	0
	Traversable medians	1	0
	Accessible/widen shoulder to 10 ft	2	1
Shoulder Design	Drivable shoulder to 11-12 ft	2	1
	Hard shoulder running/Dynamic shoulders	2	1
	Emergency pull-offs/Turnouts, Crash investigation sites	2	0
	Bus turnouts	0	0
Ramps Design and Use	Ramp widening (All lanes)	2	1
	Ramp closure (time of day)	1	1
	Off-ramp terminal traffic control	2	0
	Ramp turn restrictions (time of day)	0	0
Truck Incident Design	Runaway truck ramps	2	0
Travel Lanes Design	Add travel lanes	2	1
	Interchange modifications – ramps	2	1
	Intersection modifications – turning lanes	2	1
Animal-Vehicle Collision	Wildlife fencing over/underpass	1	0
Lane Types and Use	Contra-flow lanes – (no-notice evacuation will be scored w/ weather)	0	2
	Adding HOV lanes / HOT lanes	2	1
	Dual facilities (bypass lanes)	2	1
	Reversible lanes	1	1
	Lane reconfigurations to improve capacity or improve safety (static change, i.e., lane stripes)	1	0
Traffic Signals	Emergency vehicle traffic signal improvements	2	0
	Signal timing systems	1	0
Active Traffic Mgmt	Dynamic ramp metering / flow signals	1	1
	Variable speed limit / reduction	2	2
	Connected Vehicle System integration	2	2
	Over-height vehicle detection system	2	0
	Truck roll over warning	2	0
	Queue warning	2	0
	Integrated Corridor Management (alt routes/modes)	1	1

	Dynamic lane merging	1	0
Tolling	Converting to all electronic tolling	1	0
Weather	Fog detection warning system	0	2
	RWIS	0	2
	Flood warning systems / Wind warning systems	0	2
	Bridge heating systems / Anti-icing	0	2
	Drainage improvements	0	2
Incident Management	Incident clearance – pre staged incident response, incentive based towing, emergency relocation programs	2	0
	Safety Service Patrol	2	1
	Improvements to detour routes	2	1
	Reference location signs	1	0
	Incident detection / CAD integration	2	0
Traffic Demand Management	Park and Ride Lots	0	0
	Traveler Information/ Travel Time Information: DDMS	1	1
Transit	Additional trains on existing rail lines	0	1
	New rail lines	0	1
	New rail station / intermodal connection	0	1
	Transit AVL – Traveler Information	0	0
	Shorter headway	0	0
	New bus route	0	1
	Larger bus capacity	0	0
	Additional bus stops	0	0



# 11.0 Appendix F: Land Use Coordination Measure

**Table 11.1 Land Use Factor – Measure Summary**

ID	Measure Name	Weight	Measure Description	Measure Objective
L.1	Transportation and Efficient Land Use	100%	Project support for mixed-use development with multimodal choices, in-fill development, and corridor access management policies	The intent of this measure is to determine degree to which the project and adjacent future land use will help achieve goals for support transportation- efficient land use patterns and local policies.

## Measures Approach

### *L.1 Transportation and Efficient Land Use*

**Definition:** Measure reports the project consistency with policies and planning activities that support transportation and efficient land use. The approach is consistent for bicycle, pedestrian, transit, roadway and multimodal projects. The VDOT Transportation Efficient Land Use and Design Guide, VDOT Access Management Policies, and the Commonwealth’s Multimodal System Design Guide are good resources to understand the objectives and scoring details of this measure.

**Data Sources:** Project Application. Proposed/planned development listed in measure ED.1.

**Methodology:** Project applications should indicate the project’s ability to address the policy and planning criteria listed in Table 11.2. A project is assessed for how well the project (or region that the project is in) addresses the land use evaluation questions. With the exception of the question regarding in-fill development, points are assessed based on yes/no responses to the qualitative questions. VDOT staff will review the project application against these criteria to confirm consistency. See the guidance provided for specific steps and resources to support response to the evaluations questions in Table 11.2.

**Table 11.2 Land Use Policy Consistency/Transportation-Efficient Land Use Support**

Policy and Planning Criteria	Points (1 per question)
1. Does the project promote walkable/bicycle friendly, mixed-use development?	2
2. Does the project promote in-fill development?	2
3. Is there a locally/regionally adopted corridor/access management plan for the project area that addresses interparcel connectivity and exceeds VDOT's minimum spacing standards?	1
Total (maximum points in rows above)	5
Measure Scaling: Points will be multiplied by the future activity density as well as the change in density between today and the future (2015-2025) within the one-mile buffer surrounding the project.	

### Scoring Value

Within the application process, sponsors self assign points and provide associated documentation and rationalization for the point assessment. SMART SCALE staff will review the application details and clarify information with sponsors as necessary. Total points received based on the assessment in Table 11.2 are multiplied (scaled) by the future activity density of the area and the change in density between today and the future (2015-2025) within the one-mile buffer surrounding the project.

*Specific steps and resources to support response to the evaluations questions in Table 11.2:*

#### **1. Does the project promote walkable/bicycle friendly, mixed-use development?**

Points are awarded based on responses to the questions below.

Step 1: Is the project buffer area zoned for, or indicated on future land use maps, as “mixed use,” or the equivalent.

- If “no” then 0 points are awarded to this criterion.
- If “yes,” 1 point is awarded with the possibility of an additional point as shown in Step 2.

Step 2: Based on the project description of the proposed project, please respond to the following questions

- Does the project add or improve pedestrian or bicycle facilities and/or operations? (Yes, 0.5 point, No, 0 points)
- Does the project add or improve transit facilities and/or operations? (Yes, 1 point, No, 0 points)

The applicant may receive a maximum of two points.

To support the applicant response, more information about the types of projects that would be appropriate for “yes” responses is provided below, please use this information to assess the project and the land use at/adjacent to the project.

### *Assessment of a Project or Project Component*

To assess if the project “enhances a walkable/bicycle friendly environment” the guide provides the following examples of project types below:

- Bicycle and pedestrian facilities. Does the project incorporate facilities to improve bicycle and pedestrian mobility and safety? For example, bicycle facilities could include shared use paths, separated and protected bike lanes (cycle tracks), buffered bike lanes, conventional bike lanes, bicycle boulevards and shared roadways and bicycle facility equipment (signs, traffic signals and bicycle parking). . Pedestrian projects examples might include pedestrian signals, marked crosswalks, refuge islands, and other treatments as required (as appropriate). For more information, you may also refer to DRPT Multimodal System Design Guidelines, Chapter 6 “Key Intersection Elements for Transit, Pedestrians and Bicyclists.”<sup>10</sup>
- Multimodal street improvements. Projects that improve the grid of streets by adding a new street to shorten blocks, or alter a major roadway to a boulevard design. For more information, you may also refer to DRPT Multimodal System Design Guidelines and the associated VDOT Appendix B(2) “Multimodal Design Standards for Mixed-Use Centers.”<sup>11</sup>
- Transit center or facility improvements at or adjacent to mixed-use development.

### *Assessment of “Mixed Use Development” Status*

To confirm that the proposed project is within or directly adjacent to a place zoned for mixed use development, please follow the steps below:

Step 1: Draw a ¼ mile buffer around the project boundaries.

Step 2: Review the existing zoning and planned land use: Is any of the land within the buffer drawn in Step 1 above currently zoned as mixed use or parcels identified in the future land use plan as mixed use development?

### **2. Does the project support in-fill development adjacent to the project??**

Does the project support local/regional redevelopment or in-fill development?

“In-fill development” includes development or redevelopment that occurs on an underutilized or vacant tract of land encompassed by a larger area that is mostly developed. For example, in-fill development might include the construction of a new building in a small town center on a parcel that was previously vacant.

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<sup>10</sup> [http://www.drpt.virginia.gov/media/1055/drpt\\_mmsdg\\_final\\_full.pdf](http://www.drpt.virginia.gov/media/1055/drpt_mmsdg_final_full.pdf)

<sup>11</sup> [http://www.extranet.vdot.state.va.us/locdes/Electronic\\_Pubs/2005%20RDM/Appen dB\(2\).pdf](http://www.extranet.vdot.state.va.us/locdes/Electronic_Pubs/2005%20RDM/Appen dB(2).pdf)

Another example might be construction a development on a parcel that was previously a surface parking lot in an urban center. Examples of development that should not be included as in-fill include development projects on “greenfields” (large tracts of undeveloped land), projects that require expansion of the service utility area, and projects that are to be built in areas that are largely undeveloped.

To respond to this question, please assess the planned or proposed developments identified and used for calculation in the Economic Development measure 1 (ED.1) to determine if these projects are in-fill projects. To qualify as Active or Proposed In-fill developments the site must be adjacent to the project corridor or be within ½ mile of a transit station or transit service improvement. In addition, please consider planned or active residential in-fill development projects (these are excluded from ED.1). Points are awarded based on whether or not there is in-fill development, and if that development is active or planned development.

If the In-fill projects described in ED are:

- Active: 2 points
- Proposed: 1 points

**3. Is there a locally/regionally adopted corridor/access management plan for the project area that addresses inter-parcel connectivity and exceeds VDOT’s minimum spacing standards?**

Yes, 1 point. No, 0 points. For more information on VDOT’s minimum entrance spacing standards, see Appendix F of the Virginia Road Design Manual.

Corridor access management plans offer flexibility in the application of the access management regulations and standards to meet the special needs of different areas of the state. In addition to entrance spacing, corridor/access management plans should include recommendations for cross-parcel access, shared entrances. These plans may also establish a network of parallel roadways to the main corridor that would serve to divert traffic. The plans may include recommendations regarding turn lanes, limiting entrance movements, signal synchronization, closing median crossovers and locations for new median crossovers.

### **Scaling**

To calculate activity density, a one-mile buffer will be drawn (by SMART SCALE staff) around the project. Scaling will be based on both future density and the growth in density between 2015 and 2025 within the one-mile buffer surrounding the project. It is expected that the horizon year will be extended beyond 2025 in future SMART SCALE biennial cycles. The projected future employment density (jobs per square mile) for the horizon year will be added to the projected future population density (population per square mile) for the horizon year and the growth in density between today and the horizon year.

Activity Density = Future Density ((Future Jobs + Future Population)/ Area in sq. mileage) + Growth in Density (Future Density – Existing Density)