

***Richmond Area MPO  
RSTP and CMAQ Project Review,  
Selection, and Funds Allocation  
Process***

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Prepared for  
Richmond Area Metropolitan Planning Organization (MPO)

Town of  
*Ashland*  
Counties of  
*Charles City*  
*Chesterfield*  
*Goochland*  
*Hanover*  
*Henrico*  
*New Kent*  
*Powhatan*  
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## **Acknowledgment**

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## Introduction

This report describes the process to identify and select transportation projects for inclusion in the Richmond Area Metropolitan Planning Organization (MPO) Transportation Improvement Program. The Transportation Improvement Program (TIP) is a prioritized and financially constrained list of transportation projects for the MPO study area. The selection process described throughout this report is to be used for all proposed projects using federal Regional Surface Transportation Program (RSTP) and Congestion Mitigation and Air Quality Improvement (CMAQ) program funds, starting with the 2008 fiscal year. The process will be undertaken annually and will include the programming of funds over a six-year period. Eligible applicants for RSTP projects include MPO member jurisdictions or agencies within the MPO Study Area; eligible applicants for CMAQ projects include those MPO member jurisdictions or agencies within the area previously defined by the Environmental Protection Agency as non-attainment for Ozone.

The report is divided into two sections:

- A. Project Selection Process for RSTP Funds
- B. Project Selection Process for CMAQ Funds

The process developed for projects using RSTP funds includes four major steps: 1) application process and preliminary screening; 2) project evaluation; 3) project selection; and 4) project prioritization. The first part of this report provides a detailed description for each of these steps.

The process developed for projects using CMAQ funds includes four major steps: 1) application process and initial screening; 2) emissions analysis of eligible projects; 3) project ranking; 4) project recommendation and approval. The second part of this report provides a detailed description for each of these steps.

## **Section A: Regional Surface Transportation Program**

### **I. RSTP Program Goals**

At the December 09, 2004 MPO meeting, the following goals for the use of RSTP funds were established:

- RSTP funds should be allocated and implemented in a manner consistent with the current federal guidelines for their use.
- RSTP funds should be used, whenever possible, to leverage other available fund sources to complete a project.

### **II. Guidelines for New Projects**

Funding of new projects is considered with priority given to funding existing RSTP projects. A new project is defined as any project that is not currently found in the MPO's historical RSTP allocation tracking sheets. The historical tracking sheets cover every project selected by the MPO to receive allocations of RSTP funds and track all approved allocation transfers between projects.

### **III. Policies and Procedures Governing the Competitive RSTP Project Selection Process**

#### Implementation Schedule and Project Selection

Project selection and allocation process covers funding for six fiscal years. Project selection and allocations will be determined based on the goal of providing needed funds to existing RSTP projects identified on the MPO tracking sheets. Priority will be given to funding existing RSTP projects in need of additional funding to complete the MPO approved phases.

Consideration will be given to funding proposed new projects following a review of existing project needs. In addition to information provided in the proposed project application, an applicant's (i.e. jurisdiction or agency) current allocations to existing projects will be considered along with the applicant's record of progress in completing its existing projects. Priority consideration will be given to those applicants with existing projects that have been fully funded and are scheduled for completion.

### Continued Funding of Projects

Once a project has been selected by the MPO and has received initial RSTP funds, the project may continue to receive the necessary allocations required to fully fund its most current estimated cost for MPO approved phases.

These projects will not be required to compete for RSTP funds unless the scope and/or cost of the project changes as per the following guidelines:

If the cost estimate and scope of an individual RSTP funded project should change by 10% or *less* - leading to the need for increased allocations to the project in question, the locality/agency should notify MPO staff with a request and justification to continue funding the project and exclude the project from the competition for RSTP allocations. TAC will then review the request and recommend committing actual or future year RSTP funds to preserve the project. <sup>①</sup>

If the cost estimate and scope of an individual RSTP funded project should change by *more* than 10% - leading to the need for increased allocations to the project in question, the locality/agency should notify MPO staff with a request and justification for a change in the funding. TAC will then review the request and may recommend to the MPO one or any combination of the following:

- Scale back the project scope
- Use local funds
- Use urban funds
- Use secondary funds
- Use existing RSTP funds from another project
- Use future RSTP allocations
- Use future non-RSTP funds
- Have the project re-enter the competitive project selection process
- Drop the project

<sup>①</sup> Note: Guidance provided at the July 15, 2014 TAC meeting advising staff that for projects needing additional funds that result from a project cost estimate increase of 10 percent or less, action by TAC is sufficient in deciding if additional allocation of actual or future year RSTP funds are approved (i.e., no action required by MPO policy board). Following TAC's action, staff is to advise VDOT of TAC's action with the transfer of these funds made and recorded on the RSTP funds tracking sheets. For RSTP funds that were first allocated in FY 2007 or before, and are available for reallocation (i.e., funds remaining from a closed out project or being transferred from a current project), these funds can remain with the local government or agency to which they were first allocated if this local government or agency has an immediate need for these funds, and can be programmed in the TIP. If the local government or agency does not have an immediate need for these funds, they are available to be transferred to another eligible project currently programmed in the TIP and in immediate need of additional funds (see following section on "Guidelines Concerning Surplus RSTP Funds" for further details).

### Guidelines Concerning Surplus RSTP Funds

Allocations determined to be surplus for funds allocated in FY2008 or for future fiscal years will be returned for reallocation through the MPO process.

Allocations determined to be surplus from FY2007 and previous fiscal years will be eligible to be considered for transfer to another existing project phase that has been reviewed and approved through the MPO selection process. Transferring these FY2007 and previous funds is governed by the following:

- Approval by VDOT Richmond District, MPO and donor and recipient jurisdiction or agency;
- The local government or agency to which these funds were first allocated has first priority in having these funds reallocated to ready-to-go projects in their jurisdiction provided the funds can be utilized within the time limit guidelines for allocation-obligation-expenditure as approved by VDOT.
- If the local government or agency to which the funds were originally allocated does not have a ready-to-go project in need of additional funds where these funds can be allocated in accordance with the allocation-obligation-expenditure time limits, the surplus funds will be returned to the MPO for reallocation.

### RSTP Application Process and Screening

MPO staff will provide electronic copies of the application forms to eligible applicants and the forms will be accessible on the Richmond Regional Planning District Commission (RRPDC) web site. A time frame will be established to govern the return of the applications. Once received, projects will be initially screened for the following:

- Project meets all applicable requirements under Code of Federal Regulations
- Project is consistent with the current Richmond Area MPO Long-Range Transportation Plan
- Project is well defined
- Reasonable data and cost estimates are provided for the project

### RSTP Project Evaluation and Methods

Once the initial screening process has been completed, projects are placed into one of the six categories shown below and then scored. Projects with insufficient data or late submittals are not included in the process and are dropped from any further consideration. Projects within each category are then compared to one another. A team including MPO, VDOT District, and VDOT Environmental staffs evaluates all projects according to the approved criteria. MPO staff then prepares a list of candidate projects that have been scored and ranked by category. The list of candidate projects is then submitted to TAC for review and recommendation to the MPO.



The six categories used to score candidate RSTP projects are as follows:

1. Highway capacity, accessibility, and operational improvements
  - Roadway Widening, New Facility/Interchange, Intersection/Interchange Improvements (Table 1a)
  - Corridor Operational Improvements (Table 1b)
  - Bridge Rehabilitation (Table 1c)
2. Intermodal Transportation Projects (Table 2a)
3. Transit
  - New Service, Expansion of Existing Service, Facilities, etc. (Table 3a)
  - Vehicle Replacement/Purchase (Table 3b)
  - Other Transit Projects (Table 3c)
4. Planning Studies (Table 4a)
5. Intelligent Transportation Systems (Table 5a)
6. Non-Motorized Projects
  - Bicycle Projects
  - Pedestrian Projects

The following tables provide a description of the evaluation criteria and methods to be used in scoring the candidate RSTP projects.

1. Highway capacity, accessibility, and operational improvements

**Table 1A: Roadway Widening, New Facility/Interchange, Intersection/Interchange Improvements**

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Scoring Instructions</i>
Congestion Level	0-20	Existing and future conditions (10 points each): Severe=10, moderate=5, low=0
Cost-Effectiveness	0-20	Lowest cost/vmt = 20 Highest cost/vmt = 0 Straight line interpolation (Relative Scale)
System Continuity	0-15	Completion of a missing link in the transportation system: Total completion = 15 Partial completion = 7
Safety	0-25	25 points to the project with the highest safety improvements Straight line interpolation (Relative Scale)
Air Quality	0-10	Reduces NOx = 6 points Reduces VOC = 4 points
Project Readiness	0-10	Projects with detailed design and cost estimates that are ready to be undertaken = 5 points Projects with additional committed funding source = 5 points

**Table 1B: Corridor Operational Improvements**

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Scoring Instructions</i>
Arterial LOS based on Average Travel Speed	0-20	Relative Scale-Maximum points to arterial with lowest average speed (worst LOS), 0 to arterial with LOS C or better
ADT of Roadway	0-20	Existing and future ADT (10 points each). Relative scale-maximum points to highest corridor ADT/lane
Cost-Effectiveness	0-30	Relative Scale-Maximum points to project with lowest cost/vmt
Existing Accident Experience	0-20	Relative Scale-Maximum points to the project with highest accident rate or frequency
Project Readiness	0-10	Projects with detailed design and cost estimates that are ready to go = 5 points Projects with additional committed funding source = 5 points

**Table 1C: Bridge Rehabilitation**

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Scoring Instructions</i>
Bridge Condition per VDOT Sufficiency Index	0-60	Relative Scale-Maximum points to the bridge with the worst condition
ADT of Bridge	0-30	Relative Scale-Maximum points to the bridge with the highest ADT
Project Readiness	0-10	Projects with detailed design and cost estimates that are ready to go = 5 points Projects with additional committed funding source = 5 points

## 2. Intermodal Transportation Projects

**Table 2A: Intermodal Facilities**

<i>Evaluation Consideration</i>	<i>Points</i>
Will the project establish opportunities for linkages or connections between transportation modes or existing corridors or centers?	0-40 points
Will the project improve the operating system to better accommodate intermodal movements?	0-25 points
Will the project improve rail or vehicular access to freight distribution facilities, ports, or major industrial clients?	0-25 points
Project Readiness: Projects with detailed design and cost estimates that are ready to go = 5 points Projects with additional committed funding source = 5 points	0-10 points

## 3. Transit

**Table 3A: Transit – New Service, Expansion of Existing Service, Facilities, etc.**

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Scoring Instructions</i>
Congestion Relief	0-10	Impacts of new/expanded service on area highways: 10 points to the project with the highest % of trips removed from highways; 0 points to projects with no impact on adjacent highway
Facility Usage – Daily Ridership	0-20	Relative Scale Highest ridership = 20 points Lowest Ridership = 0 points
Cost Effectiveness – Subsidy per Passenger	0-20	Relative Scale Lowest subsidy per passenger = 20 points Highest subsidy per passenger = 0 points
Air Quality	0-20	NO <sub>x</sub> reductions = 12 points VOC reductions = 8 points
Coverage Area	0-20	Relative Scale based on population & employment data
Project Readiness	0-10	Projects with detailed design and cost estimates that are ready to go = 10 points Projects with additional committed funding source = 5 points

**Table 3B: Transit – Vehicle Replacement/Purchase**

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Scoring Instructions</i>
Average Age of Vehicles	30	FTA standards
Number of Vehicles to Replace/Total Fleet	10	
Emissions Changes of the Old and New Vehicles	0-25	
Cost Effectiveness	0-20	Cost/ridership
Average Mileage of the Vehicles to be replaced	15	FTA standards

**Table 3C: Other Transit Projects**

<i>Evaluation Criteria</i>	<i>Points</i>
Will the project increase service reliability of the transit system?	0-25
Will the project improve passenger safety, comfort, and convenience	0-30
Does the project improve the efficiency of the transit system?	0-10
Does the project improve the revenue collection?	0-25
Does the project improve transit data collection efforts?	0-10

#### 4. Planning Studies

**Table 4A: Planning Studies – Alternatives Analyses and Feasibility Studies**

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Yes or No</i>
Is the study necessary to address a major issue or to revise the LRTP?	0-25	
Is the study necessary to address a safety issue?	0-15	
Is the study concerned with encouraging multimodal transportation?	0-10	
Does the study address the region's mobility or accessibility needs?	0-20	
Is the study well defined in terms of purpose, design concept, and scope?	0-10	
Do the study goals/objectives show support for economic development?	0-10	
Do the goals/objectives foster environmental preservation/protection?	0-10	

## 5. Intelligent Transportation Systems

**Table 5A: Intelligent Transportation Systems**

<i>Evaluation Consideration</i>	<i>Points</i>
Will the project improve traffic flow during peak congestion periods/special events?	0-25
Will the project directly reduce the number and severity of roadway incidents?	0-25
Does the project address the mobility or accessibility needs of the region?	0-10
Does the project increase the linkage and communications among various operating agencies to provide better traffic information to the public?	0-20
Is the project part of the Regional ITS Architecture or Regional ITS Architecture Deployment Plan?	0-20

## 6. Non-Motorized Transportation Projects

**Table 6: Bicycle & Pedestrian Projects**

6-1. Projects which will benefit a large number of people (0-20 points)

Projects will be evaluated on the estimated user base within a logical distance from the project. A three-mile radius will be used for bicycle projects and a half-mile radius will be used for pedestrian projects. Richmond Area MPO Transportation Analysis Zone (TAZ) geography will be used to determine base year and projected year population and employment as defined in the adopted socioeconomic report, except where applicants can document other user data in the effected area. The highest user base will get 20 points and 0 for the lowest.

6-2. Projects which meet potential needs (0-30 points)

Projects will be evaluated based on the potential need for improvements.

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Scoring Instructions</i>
Potential Need for Improvements	10	Completion of a missing link as part of phased construction
	10	Providing access to transit stations, park & ride lots, etc.
	10	Eliminating a barrier to major destinations

6-3. Transportation Function (0-10 points)

<i>Evaluation Criteria</i>	<i>Points</i>	<i>Scoring Instructions</i>
Transportation Function	5	Primarily serves trips to work or school
	5	Serves other utilitarian trips (personal business, shopping, recreation, etc.)

6-4. Cost-Effectiveness (0-20 points)

Projects will be evaluated by dividing the combined scores from criteria 1-3 by the total project cost. The project will be scaled from 20 points to 0 points with the project with the highest cost effectiveness ratio receiving 20.

6-5. Projects which are regional/multi-jurisdictional (0-10 points)

Projects with more than one jurisdiction participating in providing a significant amount of the matching funds will receive 10 points.

6-6. Project Readiness (0-10 points)

Projects with detailed design and cost estimates that are ready to go = 5 points.  
 Projects with additional committed funding source = 5 points

#### **IV. RSTP Project Selection and Prioritization**

Following development of MPO staff review and recommendation based on the previous discussed process, TAC reviews, discusses, and revises candidate projects and allocations as appropriate. Projects are recommended for funding based on the following:

- Project score/rank
- Funding availability
- Other criteria (prior commitments, federal/state mandates, etc.)

Selected projects are assigned to fiscal years based on priority and on project readiness. The final prioritized list of projects is then submitted to the MPO for review and approval. Once approved by the MPO, staff works with VDOT to include each project’s allocations in the *Virginia Transportation Six Year Improvement Program*. Selection of projects for inclusion in the MPO’s Transportation Improvement Program is based on policies and procedures for programming projects in the TIP (requires consideration of federal funds obligation requirements as set forth by state and federal policies).

## **Section B: Congestion Mitigation & Air Quality Improvement Program**

### **I. CMAQ Program Goals**

CMAQ funds are allocated by the MPO to those projects that best meet the following set of goals for the use of CMAQ funds:

- Achieves highest reduction in volatile organic compounds (VOC) and nitrogen oxides (NO<sub>x</sub>)
- Improve air quality over the long term
- Provide funding for mix of forward thinking and traditional projects
- Projects of regional significance should be given preferential consideration

### **II. Guidelines for New Projects**

Funding of new projects is considered with priority given to funding existing CMAQ projects. A new project is defined as any project that is not currently found in the MPO's historical CMAQ allocation tracking sheets. The historical tracking sheets cover every project selected by the MPO to receive allocations of CMAQ funds and track all approved allocation transfers between projects.

### **III. Policies and Procedures Governing the Competitive CMAQ Project Selection Process**

#### Implementation Schedule and Project Selection

Project selection and allocation process covers funding for six fiscal years. Project selection and allocations will be determined based on the goal of providing needed funds to existing CMAQ projects identified on the MPO tracking sheets. Priority will be given for funding for existing projects in need of additional funds to complete the MPO approved phases.

Consideration will be given to funding proposed new projects following a review of existing project needs. In addition to information provided in the proposed project application, an applicant's (i.e. jurisdiction or agency) current allocations to existing projects will be considered along with the applicant's record of progress in completing its existing projects. Priority consideration will be given to those applicants with existing projects that have been fully funded and are scheduled for completion.

### Continued Funding of Projects

Once a project has been selected by the MPO, and has received initial CMAQ funds, the project may continue to receive the necessary allocations required to fully fund its most current estimated cost for MPO approved phases.

These projects will not be required to compete for CMAQ funds unless the scope and/or cost of the project changes as per the following guidelines:

If the cost estimate and scope of an individual CMAQ funded project should change by 10% or *less* - leading to the need for increased allocations to the project in question, the locality/agency should notify MPO staff with a request and justification to continue funding the project and exclude the project from the competition for CMAQ allocations. TAC will then review the request and recommend committing actual or future year CMAQ funds to preserve the project. <sup>①</sup>

If the cost estimate and scope of an individual CMAQ funded project should change by *more* than 10% - leading to the need for increased allocations to the project in question, the locality/agency should notify MPO staff with a request and justification for a change in the funding. TAC will then review the request and may recommend to the MPO one or any combination of the following:

- Scale back the project scope
- Use local funds
- Use urban funds
- Use secondary funds
- Use existing CMAQ funds from another project
- Use future CMAQ allocations
- Use future non-CMAQ funds
- Have the project re-enter the competitive project selection process
- Drop the project

<sup>①</sup> Note: Guidance provided at the July 15, 2014 TAC meeting advising staff that for projects needing additional funds that result from a project cost estimate increase of 10 percent or less, action by TAC is sufficient in deciding if additional allocation of actual or future year CMAQ funds are approved (i.e., no action required by MPO policy board). Following TAC's action, staff is to advise VDOT of TAC's action with the transfer of these funds made and recorded on the CMAQ funds tracking sheets. For CMAQ funds that were first allocated in FY 2007 or before, and are available for reallocation (i.e., funds remaining from a closed out project or being transferred from a current project), these funds can remain with the local government or agency to which they were first allocated if this local government or agency has an immediate need for these funds, and can be programmed in the TIP. If the local government or agency does not have an immediate need for these funds, they are available to be transferred to another eligible project currently programmed in the TIP and in immediate need of additional funds (see following section on "Guidelines Concerning Surplus CMAQ Funds" for further details).



### Guidelines Concerning Surplus CMAQ Funds

Allocations determined to be surplus for funds allocated in FY2008 or for future fiscal years will be returned for reallocation through the MPO process.

Allocations determined to be surplus from FY2007 and previous fiscal years will be eligible to be considered for transfer to another existing project phase that has been reviewed and approved through the MPO selection process. Transferring these FY2007 and previous funds is governed by the following:

- Approval by VDOT Richmond District, MPO and donor and recipient jurisdiction or agency;
- The local government or agency to which these funds were first allocated has first priority in having these funds reallocated to ready-to-go projects in their jurisdiction provided the funds can be utilized within the time limit guidelines for allocation-obligation-expenditure as approved by VDOT.
- If the local government or agency to which the funds were originally allocated does not have a ready-to-go project in need of additional funds where these funds can be allocated in accordance with the allocation-obligation-expenditure time limits, the surplus funds will be returned to the MPO for reallocation.

### RideFinders Yearly Allocation Guidelines and Requirements

RideFinders will receive an annual baseline allocation of \$500,000 in CMAQ allocations; the base amount will be evaluated and adjusted annually based on changes to the consumer price index. In addition to receiving CMAQ funds, RideFinders is eligible to apply for project or program element funding through the RSTP application process.

RideFinders will diversify the revenue sources utilized to provide operational support for the TDM program. The goal will be that by 2020, RideFinders will have significantly increased funding from sources other than Richmond Area MPO allocations. This progress will be evaluated with the annual work program and budget.

RideFinders will provide a detailed work program covering a three year period including the coming fiscal year and projections for the two future fiscal years. The work program will be submitted as a component of the annual funding selection process beginning with fiscal year 2015 and will identify all sources and amounts of funding for program elements. This work program will also include an annual emissions benefit reduction analysis of all CMAQ eligible work activities. This emissions reduction analysis will be coordinated by the MPO through VDOT Environmental Division review procedures based on data supplied from RideFinders.

The MPO allocation recommendation will provide actual funding for the coming fiscal year and projected allocations for the next two fiscal years. The out-year allocations will be evaluated during the next funding cycle similar to the review given to all active RSTP and CMAQ projects.

### CMAQ Application Process and Screening

Richmond Area MPO staff will provide application forms to MPO jurisdictions and agencies in advance. The application forms will be available in an electronic format and they will be accessible via the Richmond Regional Planning District Commission (RRPDC) web site and through e-mail distribution. A time frame will be established to govern the return of the applications. Once received, projects will be initially screened for the following:

- Project meets all applicable requirements under Code of Federal Regulations
- Project is consistent with the current Richmond Area MPO Long-Range Transportation Plan
- Project is well defined
- Reasonable data (including data required for the emissions analysis) and cost estimates are provided for the project

### Emissions Reduction Analysis of Eligible Projects

Once the initial screening has been conducted, MPO staff, working with VDOT Environmental staff, will confirm the emissions reduction analysis provided on all eligible projects. The MPO's local governments and agencies will be required to provide assistance with emissions analyses, as needed. Emissions are estimated for volatile organic compounds (VOC) and nitrogen oxides (NO<sub>x</sub>). Analysis results are tabulated for the eligible projects.

## CMAQ Project Ranking and Selection

### *Project Ranking*

CMAQ projects are ranked based on their cost-effectiveness ratios for VOC and NO<sub>x</sub> reduction. Each project is analyzed to estimate the impact of the project on VOC and NO<sub>x</sub> emissions. The cost per reduction of emissions is computed using the total cost of each project and annualizing the cost over the effective life of the project. Once all of the projects are analyzed, they are ranked on the basis of their cost-effectiveness ratios. In the cost-effectiveness analysis, the amount of emissions reduction per dollar spent is computed for VOC and NO<sub>x</sub>. A rank is then applied for each of these emission types, with a lower rank number indicating greater cost effectiveness. Finally, the two ranks are combined and these composite ranks are scored with the lower composite rank number indicating greater cost effectiveness.

### *Project Selection*

The MPO TAC receives a ranked set of eligible CMAQ projects, including a staff recommendation for funding. The TAC reviews the staff recommendation and recommends a list of projects and allocations to the MPO for action. Once approved by the policy board, MPO staff works with VDOT to include each project's allocations in the *Virginia Transportation Six Year Improvement Program*. Selection of projects for inclusion in the MPO's Transportation Improvement Program is based on policies and procedures for programming projects in the TIP (requires consideration of federal funds obligation requirements as set forth by state and federal policies).

## CMAQ Analysis Methodologies

Projects proposed for CMAQ funding are analyzed for their effectiveness in reducing emissions of VOCs and NO<sub>x</sub>. The analysis methodologies for various types of CMAQ projects can be divided into the following primary groups:

- Highway Projects
- Non-Highway Projects
- ITS Projects
- Other Projects

### *Highway Projects*

Eligible highway projects include improvements to traffic signal timing and intersection/interchange geometric design, and upgrades to traffic signal systems. Analysis methodologies vary depending on the type of project being evaluated. A brief description of the analysis methods used for each type of highway project is included on the following pages.

### *Isolated Intersection Analysis*

This project type refers to improvements at individual intersections that are not part of a coordinated signal system. The projects may include improvements in the geometric design of the intersection and signal timing or improvements in timing only. The change in emissions for a project is based on the change in delay (in hours per day) at the intersection as a result of the project.

Highway Capacity Software is used to compute the intersection delay for the afternoon peak hour with and without the project. Then, using the total number of vehicles entering the intersection during the afternoon peak hour, and the change in intersection delay resulting from the project, vehicle hours of delay are computed for the afternoon peak hour. That value is then converted to vehicle-hours of delay per day by using a seventeen percent conversion factor derived in the *Cost Benefit Model for Intersection Level of Service Improvements*, a study published by the Hampton Roads Planning District Commission in 1997. The idle emissions factors are applied to the vehicle-hours of delay per day to compute the change in emissions of VOC and NO<sub>x</sub> for the intersection in units of kilograms per day.

### *Coordinated Signal Systems*

This type of project includes several intersections along a section of roadway for which the signal timing is coordinated to promote progression of traffic along that segment. Most of the projects in this category consist of improvements to signal timing only. The change in emissions for a project is based on the change in average speed (in miles per hour) along the section of roadway as a result of the project.

The initial average speed along the section of roadway is either submitted with the project proposal or taken from one of the RRPDC Regional Travel Time and Speed studies. For the purposes of the emissions analyses, an increase of four miles per hour in average speed will be assumed to occur as a result of coordinated signal system projects. This figure is derived from a series of before and after studies of coordinated signal system improvements conducted by the Hampton Roads Planning District Commission in the early 1990's.

The emissions factors are determined for the "before" and "after" average speeds along the corridor. These factors are multiplied by the daily vehicle-miles traveled (VMT) for the section of roadway to compute the daily change in emissions of VOC and NO<sub>x</sub> for the roadway segment in units of kilograms per day.

### *Countywide and Citywide Signal System Improvements*

This type of project includes signal system improvements to a large number of intersections within a jurisdiction. Nearly all of the intersections included in this type of project are part of a coordinated signal system. The projects in this category include improvements to signal equipment and signal timing. The change in emissions for a project is based on the change in average speed (in miles per hour) for the jurisdictional system.

To analyze these projects, countywide or citywide values for average speed and VMT for principle and minor arterials are obtained from a VDOT Air Quality Conformity Analysis. Using the analysis discussed in the section on analyzing coordinated signal systems, a four mile per hour increase in average speed is assumed to result from the project. If the applicant submits additional before and after data and analyses, staff will use this data in lieu of the average value estimated for this category.

The emissions factors are determined for the before and after average speeds. These factors are multiplied by the countywide or citywide daily VMT to compute the daily change in emissions of VOC and NO<sub>x</sub> in units of kilograms per day.

## **Non-Highway Projects**

### *Transit Projects*

Transit projects include replacement buses, and new/expanded transit services or facilities. Emissions benefits for most transit projects are based on the predicted reduction in automobile trips and VMT resulting from the project. Projects that involve new or expanded service also take into account the increase in emissions due to the operation of the new transit vehicles. Park & ride lot projects take into account the emissions due to the automobile trips to the lot. Emissions reductions resulting from replacement buses are due to emissions improvements in the newer bus engines and any increase in ridership due to newer vehicles.

### *Bikeway Projects*

Air quality benefits of bikeway projects are calculated as a function of a reduction in the number of automobile trips and VMT. Analysis methods for bicycle projects are typically project specific and may be qualitative or quantitative depending on the type of project and the availability of input data.

## **Intelligent Transportation Systems (ITS)**

A wide array of highway and transit projects are classified as ITS projects, such as:

- Advanced traffic management systems
- Changeable message signs
- Communications improvements
- Video surveillance infrastructure
- Automatic vehicle location and passenger counting for transit purposes
- Emergency vehicle notification systems
- Automatic road enforcement

These projects take advantage of new technologies aimed at improving traffic flow, reducing response time to traffic incidents, improving safety, and providing timely information to the traveling public. Analysis methods for ITS projects are typically project specific and may be qualitative or quantitative depending on the type of project and the availability of input data.

### **Other Projects**

The *other* project category includes Transportation Demand Management and those projects that do not fit into the Highway or Non-Highway groups. Analysis methods for these projects are typically project specific and may be qualitative or quantitative depending on the type of project and the availability of input data

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