HAMPTON ROADS TRANSPORTATION PLANNING ORGANIZATION

CMAQ/RSTP PROJECT SELECTION PROCESS 2022

HAMPTON ROADS TPO

T23-09

JULY 2023

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ABSTRACT

This report summarizes the 2022 selection process for projects to be funded under the Congestion Mitigation and Air Quality Improvement Program (CMAQ) and Regional Surface Transportation Program (RSTP). Projects selected for funding as part of this process received allocations of CMAQ/RSTP funds for Fiscal Year 2029.

ACKNOWLEDGMENTS

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HAMPTON ROADS TRANSPORTATION PLANNING ORGANIZATION
CMAQ/RSTP PROJECT SELECTION PROCESS

2022

This report was included in the Unified Planning Work Program
for Fiscal Year 2023, which was approved by the Board of the
Hampton Roads Transportation Planning Organization
On May 19, 2022, and updated on October 20, 2022.

PREPARED BY:

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

JULY 2023

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Section I
Executive Summary

EXECUTIVE SUMMARY

As the Metropolitan Planning Organization (MPO) for the Hampton Roads area, the Hampton Roads Transportation Planning Organization (HRTPO) is responsible for project selection and allocation of funds under two federal funding programs – the Congestion Mitigation and Air Quality (CMAQ) Improvement Program and the Regional Surface Transportation Program (RSTP). The process used by the HRTPO to select projects to receive funds from these two programs is referred to as the CMAQ/RSTP Project Selection Process. The project selection process is conducted annually, normally beginning in July.

The Hampton Roads Transportation Planning Organization (HRTPO) on February 16, 2023 approved $52.4M in funding from two federal programs for 32 individual improvement projects all across the region. The approved allocations are for Fiscal Year 2029 and are advanced under the CMAQ and RSTP initiatives. The CMAQ program provides federal funding for projects that improve air quality. RSTP funding is available more generally for a wide variety of transportation project categories.

This report summarizes the work of selecting CMAQ and RSTP projects during 2022 CMAQ/RSTP Project Selection Process. Selected projects received awards of CMAQ or RSTP funds for Fiscal Year (FY) 2029 (July 2028 – June 2029). The region conducts the CMAQ/RSTP Project Selection Process annually. CMAQ and RSTP project selections and allocations which were developed with the assistance of two HRTPO subcommittees: the Transportation Programming Subcommittee (TPS) and the Transportation Technical Advisory Committee (TTAC).

For the current project selection cycle, 38 new CMAQ applications and 31 RSTP applications were submitted for funding consideration. The committees reviewed both the funding requirements of existing CMAQ and RSTP projects and also the scores and rankings of all new submissions in developing its funding recommendations in both programs. The complete competitive process used to select projects to receive funds from these two programs has been approved by the HRTPO Board and is documented in the Guide to the HRTPO CMAQ/RSTP Project Selection Process (https://www.hrtpo.org/page/cmaq-and-rstp/).

For the CMAQ program, half of the funded projects address traffic signal system, timing, and coordination improvements in Chesapeake, Norfolk, Portsmouth, Suffolk, and Virginia Beach, since such projects have been shown to be very cost effective in reducing vehicle emissions. The largest CMAQ funding award, $4.9 million, went to needed safety improvements along the major Route 460/58/13 corridor in Chesapeake. The remaining CMAQ awards support selected intersection improvements in Chesapeake and Suffolk, transit bus purchases for the Williamsburg Area Transit Authority, efficiency improvements in the movement of shipping containers in and around the Port of Virginia, and a Complete Streets lane repurposing project in Norfolk. The full 2022 CMAQ project selection process is reviewed in detail in Section III.

New bus purchases for Hampton Roads Transit represent the largest RSTP funding allocation at approximately $9.5 million. Reflecting the great flexibility of the RSTP program, the remaining funding allocations are divided between the regional travel demand management program, five road widening and improvement efforts, three active transportation (non-motorized) projects,

two traffic signal system upgrades, three studies, and one safety enhancement across nine different jurisdictions and agencies. The full 2022 RSTP project selection process is reviewed in detail in Section IV.

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Section II
Background

INTRODUCTION

The Hampton Roads Transportation Planning Organization (HRTPO) is the Metropolitan Planning Organization (MPO) for the Hampton Roads region of Virginia. As such, it is a federally mandated transportation policy board comprised of representatives from local, state, and federal governments, transit agencies, and other stakeholders and is responsible for transportation planning and programming for the Hampton Roads Metropolitan Planning Area (MPA). The MPA is comprised of the cities of Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg; the counties of Isle of Wight, James City, and York; and a portion of the City of Franklin and Counties of Gloucester and Southampton. Among its functions, the HRTPO is responsible for project selection and allocation of funds under two federal programs – the Congestion Mitigation and Air Quality (CMAQ) Improvement Program and the Regional Surface Transportation Program (RSTP).

The CMAQ Program provides funding to state departments of transportation (DOTs), local governments, and transit agencies for projects and programs that help meet the requirements of the Clean Air Act by reducing mobile source emissions and regional congestion on transportation networks. Eligible CMAQ funded activities include efforts such as transit improvements, travel demand management strategies, congestion relief efforts (such as high occupancy vehicle lanes), diesel retrofit projects, alternative fuel vehicles and infrastructure, and medium- or heavy-duty zero emission vehicles and related charging equipment. This funding is intended for areas designated by the U.S. Environmental Protection Agency (EPA) as nonattainment or maintenance areas with regard to the National Ambient Air Quality Standards (NAAQS).

A *nonattainment area* is one that does not meet the NAAQS for one or more pollutants. A *maintenance area* is one that was originally designated a nonattainment area, but later met the NAAQS. The Hampton Roads region was in "maintenance" for the 1997 NAAQS for ozone and so was subject to transportation conformity rule requirements before the Environmental Protection Agency (EPA) revoked that standard effective April 6, 2015 (Federal Register, Volume 80, Number 44, March 6, 2015.) With that revocation, transportation conformity requirements were no longer applicable for the Hampton Roads region.

On February 16, 2018, the United States Court of Appeals for the District of Columbia Circuit issued its decision in *South Coast Air Quality Mgmt. District v. EPA* ("South Coast II," 882 F.3d1138) and held that transportation conformity determinations must be made in all so-called "orphan" areas nation-wide that were either nonattainment or maintenance for the 1997 ozone NAAQS and attainment for the 2008 ozone NAAQS when the 1997 ozone NAAQS was revoked. The Hampton Roads region met both conditions, and therefore, conformity requirements for the 1997 ozone NAAQS were once again applicable for Hampton Roads.

On April 23, 2018, in response to the South Coast II court decision, FHWA and FTA issued *Interim Guidance on Conformity Requirements for the 1997 Ozone NAAQS*, which specified that any updates and amendments to the Long-Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP) for projects "*not exempt from transportation conformity may not*

proceed until transportation conformity with the 1997 ozone NAAQS is determined." In November 2018, EPA issued "*Transportation Conformity Guidance for the South Coast II Court Decision*" that eliminated modeling requirements for orphan areas (given the revocation of the applicable 1997 ozone NAAQS), which substantially streamlined the reinstated conformity requirements for those areas.

The Surface Transportation Program (STP) provides federal funding that may be used by states and localities for a wide range of highway and transit projects. Regional Surface Transportation Program (RSTP) funds are STP funds that are apportioned to specific regions within a state.

This report summarizes the work of selecting CMAQ and RSTP projects during the CMAQ/RSTP Project Selection Process of 2022. Projects selected received allocations of CMAQ or RSTP funds for FY 2029.

ELIGIBLE RECIPIENTS

Eligible recipients of CMAQ and RSTP funds in Hampton Roads include the localities within the MPA, Hampton Roads Transit (HRT), the Williamsburg Area Transit Authority (WATA), Suffolk Transit, state transportation agencies, Virginia Port Authority, National Park Service, and the HRTPO.

PROJECT SELECTION PROCESS

The process for obtaining CMAQ or RSTP funding for transportation projects is a competitive one. According to the CMAQ/RSTP Project Selection Process that has been approved by the HRTPO Board, all project proposals are analyzed by HRTPO staff using a specific set of evaluation criteria. The proposed projects are then ranked based on the results of the analyses. All proposed projects must be consistent with the current HRTPO Long-Range Transportation Plan (LRTP). The LRTP is a financially constrained transportation plan for the Hampton Roads MPA with a planning horizon of at least 20 years. The schedule used for the 2022 CMAQ/RSTP project selection process is listed below. Table 1 on the following page details the available funding, current funding allocations, and available totals currently held in reserve for both the CMAQ and RSTP programs under consideration and discussion during the current project selection process.

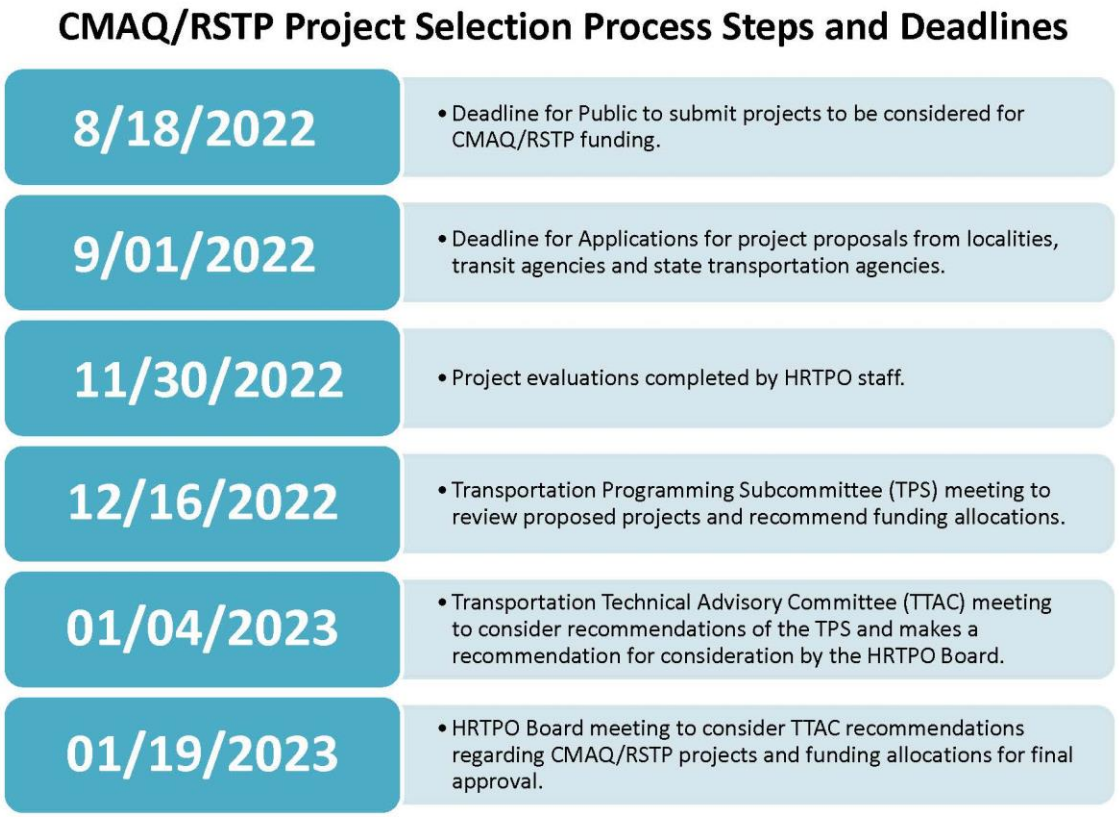

Table 1 | FY 2023-2029 CMAQ and RSTP Funding: Available Funding, Current Allocations, and Reserves

CMAQ	Previous	FY - 23	FY - 24	FY - 25	FY - 26	FY - 27	FY - 28	FY - 29
Marks	$0	$14,941,828	$16,649,657	$16,822,103	$16,811,500	$16,967,879	$15,647,905	$15,361,905
Allocations	$0	$14,673,661	$15,899,657	$16,527,248	$16,061,500	$16,616,357	$15,611,905	$14,981,424
Available	$0	$268,167	$750,000	$294,855	$750,000	$351,522	$36,000	$380,481
							Total	$2,831,025

RSTP	Previous	FY - 23	FY - 24	FY - 25	FY - 26	FY - 27	FY - 28	FY - 29
Marks	$0	$39,685,323	$40,306,038	$45,540,001	$45,888,786	$46,404,377	$43,629,513	$37,078,513
Allocations	$0	$39,420,324	$40,298,009	$45,489,001	$45,861,174	$46,371,168	$43,626,304	$37,060,565
Available	$0	$264,999	$8,029	$51,000	$27,612	$33,209	$3,209	$17,948
Franklin and Southampton County Set-aside	$1,878,866							
							Total	$406,006

Prepared by HRTPO staff (May 25, 2023)

PUBLIC PARTICIPATION

The HRTPO is fully committed to involving and collaborating with Hampton Roads community in a public involvement process that is grounded in partnership, mutual problem solving, and understanding. In other words, a process whereby the public feels a sense of ownership and satisfaction in knowing their voice has been legitimately heard and their thoughts, ideas, and opinions have the potential to impact future HRTPO decisions. The long term effect that such decisions can have on so many lives makes it critical that the public be provided with ongoing, dynamic opportunities to participate in the planning and programming processes associated with the complex system of roads, mass transit, rail, waterways, pedestrian and bicycle facilities, and related infrastructure that make up the transportation system.

The HRTPO understands “the public” to mean all of those who have the potential to affect or be affected by the Hampton Roads transportation system. From bicyclists to motorists, public transportation users to freight haulers, social to environmental advocates – Hampton Roads residents have a stake in the future of our transportation system. Equally important, the HRTPO recognizes that not all communities and community members have enjoyed the same level of access or representation in transportation and other decisions made by public agencies. Therefore, as part of its public involvement strategy, the HRTPO takes special steps and measures to understand and consider the wants, needs, and aspirations of minority, low-income, and other under-served groups in Hampton Roads.

The process for obtaining CMAQ or RSTP funding for transportation projects is a competitive one. Proposed projects are evaluated and ranked using a specific set of criteria that have been approved by the HRTPO Board. The Transportation Programming Subcommittee (TPS) – taking into account the available funding, policies, and priorities of the HRTPO and Commonwealth Transportation Board (CTB) and using the ranked project lists as a guide – produces a list of

recommended projects and funding allocations for consideration by the Transportation Technical Advisory Committee (TTAC) and the HRTPO Board.

In addition to the invitation for public involvement at the beginning of the process, all formal meetings associated with the CMAQ/RSTP Project Selection Process, including the agendas for meetings of both the Transportation Technical Advisory Committee (TTAC) and HRTPO Board, included an opportunity for public comment at the start of each session. The region's Community Advisory Committee was also briefed on this topic. No public comments regarding the project selection process were received, orally or in writing, during these meetings.

A public notice soliciting CMAQ and RSTP project ideas from the public was posted to the HRTPO website in July of 2022. In addition, a CMAQ/RSTP Project Idea Form was provided for use by the public with a submission deadline of July 31, 2022. Project ideas submitted by the public are reviewed by HRTPO staff and then forwarded to the appropriate locality or agency for consideration as a possible project proposal. No project ideas were received from the public this cycle as a result of this invitation.

Section III

CMAQ Project Selection

CMAQ PROJECT SELECTION

In Hampton Roads, projects are selected for funding with CMAQ Improvement Program funds based on the amount of air quality improvement expected per dollar spent. This is analyzed in terms of a reduction in the emissions of Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NOx), which are precursors of ozone depletion. The air quality aspect of the CMAQ analysis allows all types of CMAQ projects to be compared against one another.

The original analysis policies and procedures were developed in December 1992 after the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA). Over the years the policies and procedures have been reviewed and revised. Details on the policies, procedures, and analysis methodologies used for CMAQ project selection are included in the ***Guide to the HRTPO CMAQ and RSTP Project Selection Process***, which may be accessed on the HRTPO website at http://www.hrtpo.org/page/cmaq-and-rstp.

To help ensure that all of the necessary information is included with each project proposal, and to provide uniformity to the way that project information is submitted, the HRTPO staff developed application forms to be utilized for the submission of CMAQ project proposals. The ***Candidate Project Application Forms*** for the various CMAQ project categories may be accessed on the HRTPO website at http://www.hrtpo.org/page/cmaq-and-rstp.

It should be noted that the total CMAQ funding expected to be available for FY 2029, including the 20 percent state match, is approximately $15.4 million. Prior to considering new projects to receive CMAQ allocations, the status of previously approved projects is reviewed to determine whether additional funding is required to allow for the completion of a project or project phase. The review of previously approved projects also includes determining whether those projects are progressing on schedule or whether funds should be:

1. Readjusted to better correspond with any updated implementation schedules, or
2. Reallocated to other projects.

During the 2022 Project Selection Process, 12 requests were made for additional funding for currently approved CMAQ projects. The total request for FY 2029 funding for existing projects was $13.7 million, as listed in Table 3.

Table 2 shows all new projects proposed for CMAQ funding during the project selection process of 2022. As shown in the table, 38 candidate projects, with a total request of over $152.5 million, were submitted. The total request for FY 2029 funding was $30.3 million.

Table 4 shows the scoring and ranking of the 38 candidate projects (existing projects are not rescored). As shown in the table, each project was scored and ranked based on its cost-effectiveness at reducing VOC and NOx emissions. The ranks for VOC and NOx reduction were summed to produce the composite ranking. The detailed evaluation and scoring worksheets for each of the CMAQ candidate projects are included in **Appendix A.**

Table 2 | 2022 CMAQ New Candidate Projects

Number	Code	Applicant	Project Name	Total Cost	Total CMAQ Request	Total FY-29 Request
1	CH1CM	Chesapeake	Route 17/460 Intersection Improvement Project	$ 12,223,283	$ 12,223,283	$ 1,028,444
2	CH2CM	Chesapeake	Cedar Rd/S Battlefield Blvd Turn Lane	$ 2,300,000	$ 2,300,000	$ 80,000
3	CH3CM	Chesapeake	Volvo Parkway/Executive Blvd Turn Lane	$ 1,820,000	$ 1,820,000	$ 120,000
4	CH4CM	Chesapeake	Kempsville Rd/Battlefield Blvd Intersection Improvement	$ 4,127,658	$ 4,127,658	$ 836,000
5	110626	Gloucester County	Greate Road Siedwalk	$ 2,935,560	$ 2,935,560	$ 315,440
6	107414	Gloucester County	Roaring Springs Road (Rt. 616) Shared Use Path	$ 12,811,210	$ 9,821,210	$ 1,234,077
7	GC3CM	Gloucester County	Rt. 17 Court House Shared Use Path	$ 7,705,785	$ 7,705,785	$ 625,980
8	110627	Gloucester County	Rt. 17 Cloucester Point Shared Use Path	$ 15,203,285	$ 15,203,285	$ 5,685,739
9	GC5CM	Gloucester County	Tidemill Road Shared Use Path	$ 8,033,023	$ 8,033,023	$ 841,601
10	IW1CM	Isle of Wight County	Route 17 Widening at Smiths Neck Road	$ 12,256,133	$ 12,256,133	$ 1,184,926
11	IW2CM	Isle of Wight County	Route 17 and Sugar Hill Road Intersection Improvement	$ 3,070,691	$ 3,070,691	$ 415,084
12	JC1CM	James City County	Richmond Road Sidewalk Improvements	$ 1,987,920	$ 1,987,920	$ 150,000
13	JC2CM	James City County	Jamestown High School Sidewalk Improvements	$ 689,030	$ 689,030	$ 140,800
14	NN1CM	Newport News	Birthplace of America Trail: Pocahontas Trail at Green Mtn Pkwy to Warwick Blvd at Falls Reach	$ 9,878,000	$ 9,878,000	$ 2,298,000
15	NN2CM	Newport News	Citywide Traffic Signal Retiming	$ 500,000	$ 500,000	$ 500,000
16	NN3CM	Newport News	Citywide Traffic Signal System Upgrades	$ 3,691,800	$ 3,691,800	$ 1,981,800
17	NO1CM	Norfolk	Downtown Norfolk/Market St/St. Paul's Comprehensive Study	$ 2,500,000	$ 2,500,000	$ 1,250,000
18	NO5CM	Norfolk	26th Street/Lafayette Blvd Lane Repurposing	$ 2,108,651	$ 2,108,651	$ 316,943
19	NO10CM	Norfolk	Citywide Signal System Upgrades	$ 5,997,970	$ 5,997,970	$ 230,700
20	NO12CM	Norfolk	Granby St Multimodal Comprehensive Study (Bayview to Ocean View)	$ 300,000	$ 300,000	$ 150,000
21	NO13CM	Norfolk	Granby St Multimodal Comprehensive Study (Taussig to Bayview)	$ 300,000	$ 300,000	$ 150,000
22	NO16CM	Norfolk	E Indian River Rd and E Berkley Av Pedestrian Improvements	$ 710,250	$ 710,250	$ 261,989
23	NO19CM	Norfolk	Military Highway Poplar Hall Dr Shared Use Path	$ 9,245,556	$ 9,245,556	$ 448,828
24	NO25CM	Norfolk	Pope Avenue Shared Use Path	$ 249,258	$ 249,258	$ 154,111

Table 2 Continued| 2022 CMAQ New Candidate Projects

Number	Code	Applicant	Project Name	Total Cost	Total CMAQ Request	Total FY-29 Request
25	NO29CM	Norfolk	Virginia Beach Blvd at Ring Rd Pedestrian Improvements	$ 331,004	$ 331,004	$ 179,573
26	NO31CM	Norfolk	Citywide Signal Retiming Phase V	$ 680,000	$ 680,000	$ 460,000
27	SU1CM	Suffolk	Suburban Drive Sidewalk	$ 850,000	$ 850,000	$ 500,000
28	SU2CM	Suffolk	Suffolk Seaboard Coastline Trail West	$ 3,450,000	$ 3,450,000	$ 250,000
29	SU3CM	Suffolk	Citywide Traffic Signal System Timing	$ 910,000	$ 910,000	$ 490,000
30	SU4CM	Suffolk	S Quay Rd at O'Kelly Dr Turn Lane	$ 1,550,000	$ 1,550,000	$ 250,000
31	SU5CM	Suffolk	Portsmouth Blvd/Suburban Dr Intersection Improvments	$ 2,290,000	$ 2,290,000	$ 370,000
32	SU6CM	Suffolk	Route 460 Corridor Improvements	$ 15,200,000	$ 6,500,000	$ 450,000
33	SU7CM	Suffolk	Route 58 ITS Sensors	$ 3,200,000	$ 3,200,000	$ 750,000
34	SU8CM	Suffolk	Suffolk Transit Digital Bus Stop Signage	$ 1,000,000	$ 1,000,000	$ 1,000,000
35	SU9CM	Suffolk	Suffolk Transit Bus Pre-Emption	$ 37,800	$ 37,800	$ 37,800
36	SU10CM	Suffolk	Low or No Emission Replacement Bus and Charging Infrastructure	$ 6,933,075	$ 6,933,075	$ 3,466,537
37	VB1CM	Virginia Beach	Corridor Traffic Signal Retiming	$ 960,000	$ 960,000	$ 480,000
38	WT1CM	WATA	WATA Bus Replacement	$ 6,158,089	$ 6,158,089	$ 1,216,618
TOTAL				$ 164,195,031	$ 152,505,031	$ 30,300,990

Table 3 | 2022 CMAQ Previously Approved Projects

Number	Jurisdiction	Project Description	Rank	Total Cost	Total Request	FY 29 Request
Previously Approved Projects						
1	*Chesapeake*	Citywide Traffic Signal System Upgrade		$525,000	$525,000	$175,000
2	*Chesapeake*	Chesapeake Signal Timing - Phases 1-4		$600,000	$600,000	$150,000
3	*Chesapeake*	Citywide Traffic Signal System Upgrade		$1,250,000	$1,250,000	$250,000
4	*Portsmouth*	Citywide Traffic Signal System Upgrades		$1,225,000	$1,225,000	$225,000
5	*Chesapeake*	Deep Creek Elementary School Traffic Signal Improvement		$2,100,000	$2,100,000	$1,800,000
6	*Virginia Port Authority*	Green Operator Program		$5,000,000	$5,000,000	$1,000,000
7	*Chesapeake*	Chesapeake Signal System and Intersection Improvements (Transfer From UPC 119270)		$2,673,656	$2,673,656	$1,377,156
8	*Chesapeake*	Centerville Turnpike/Elbow Rd Intersection Improvements		$4,850,000	$4,850,000	$1,271,000
9	*Chesapeake*	460/58/13 Safety Improvements		$14,186,104	$14,186,104	$4,913,652
10	*Suffolk*	Wilroy Rd/Progress Rd Intersection		$2,500,000	$2,500,000	$400,000
11	*WATA*	Purchase Five (5) Buses		$2,925,000	$2,925,000	$1,424,873
12	*Suffolk*	Constance Rd/Wilroy Rd Intersection		$3,200,000	$3,200,000	$700,000
Total						$13,686,681

Table 4| 2022 CMAQ New Candidate Projects in Ranked Order

ID	Jurisdiction	Project Description	Rank	FY 29 Request	Cost-Effectiveness		Score		
New Candidate Projects					VOC	NOx	VOC	NOx	Composite[1]
NO31CM	*Norfolk*	Citywide Signal Retiming Phase V	1	$460,000	$572,865	$98,371	2	1	3
NO5CM	*Norfolk*	26th Street/Lafayette Blvd Lane Repurposing	1	$316,943	$133,863	$98,540	1	2	3
SU9CM	*Suffolk*	Suffolk Transit Bus Pre-Emption	3	$37,800	$575,076	$98,751	3	3	6
VB1CM	*Virginia Beach*	Corridor Traffic Signal Retiming	4	$480,000	$633,384	$108,763	4	5	9
SU3CM	*Suffolk*	Citywide Traffic Signal System Timing	5	$490,000	$879,832	$151,083	5	6	11
SU7CM	*Suffolk*	Route 58 ITS Sensors	6	$750,000	$1,245,575	$107,386	8	4	12
NN2CM	*Newport News*	Citywide Traffic Signal Retiming	7	$500,000	$1,208,560	$207,531	7	7	14
SU10CM	*Suffolk*	Low or No Emission Replacement Bus and Charging Infrastructure	8	$3,466,537	$1,161,992	$1,902,108	6	10	16
NO29CM	*Norfolk*	Virginia Beach Blvd at Ring Rd Pedestrian Improvements	9	$179,573	$2,097,027	$1,543,670	9	9	18
WT1CM	*WATA*	WATA Bus Replacement	10	$1,216,618	$10,901,977	$685,505	12	8	20
NO25CM	*Norfolk*	Pope Avenue Shared Use Path	11	$154,111	$2,975,186	$2,190,103	10	11	21
NO16CM	*Norfolk*	E Indian River Rd and E Berkley Av Pedestrian Improvements	12	$261,989	$4,006,567	$2,949,327	11	13	24
NO10CM	*Norfolk*	Citywide Signal System Upgrades	13	$230,700	$13,436,550	$2,307,295	13	12	25
IW1CM	*Isle of Wight County*	Route 17 Widening at Smiths Neck Road	14	$1,184,926	$19,847,498	$3,408,169	15	14	29
110626	*Gloucester County*	Greate Road Siedwalk	15	$315,440	$14,391,158	$10,593,664	14	16	30
CH2CM	*Chesapeake*	Cedar Rd/S Battlefield Blvd Turn Lane	16	$80,000	$29,521,672	$5,069,397	18	15	33
JC2CM	*James City County*	Jamestown High School Sidewalk Improvements	17	$140,800	$21,826,236	$16,066,796	17	18	35
CH1CM	*Chesapeake*	Route 17/460 Intersection Improvement Project	18	$1,028,444	$91,422,887	$15,698,939	21	17	38
GC5CM	*Gloucester County*	Tidemill Road Shared Use Path	19	$841,601	$47,941,761	$35,291,037	19	20	39
CH3CM	*Chesapeake*	Volvo Parkway/Executive Blvd Turn Lane	20	$120,000	$112,919,546	$19,390,299	22	19	41
110627	*Gloucester County*	Rt. 17 Cloucester Point Shared Use Path	20	$5,685,739	$90,734,492	$66,791,754	20	21	41
SU4CM	*Suffolk*	S Quay Rd at O'Kelly Dr Turn Lane	22	$250,000	$517,588,086	$88,879,100	26	22	48
NN1CM	*Newport News*	Birthplace of America Trail: Pocahontas Trail at Green Mtn Pkwy to Warwick Blvd at Falls Reach	22	$2,298,000	$271,182,605	$199,623,775	23	25	48
SU8CM	*Suffolk*	Suffolk Transit Digital Bus Stop Signage	24	$1,000,000	$21,372,662	*No Reduction*	16	33	49
SU5CM	*Suffolk*	Portsmouth Blvd/Suburban Dr Intersection Improvments	25	$370,000	$537,349,787	$92,272,536	27	23	50
NO19CM	*Norfolk*	Military Highway Poplar Hall Dr Shared Use Path	25	$448,828	$317,275,000	$233,553,450	24	26	50
NN3CM	*Newport News*	Citywide Traffic Signal System Upgrades	27	$1,981,800	$938,988,400	$161,241,045	28	24	52
SU2CM	*Suffolk*	Suffolk Seaboard Coastline Trail West	28	$250,000	$473,567,517	$348,603,980	25	28	53
IW2CM	*Isle of Wight County*	Route 17 and Sugar Hill Road Intersection Improvement	29	$415,084	$1,645,722,156	$282,599,827	29	27	56
SU6CM	*Suffolk*	Route 460 Corridor Improvements	30	$450,000	$2,050,694,101	$352,140,728	30	29	59
NO1CM	*Norfolk*	Downtown Norfolk/Market St/St. Paul's Comprehensive Study	31	$1,250,000	*No Ranking*	*No Ranking*	31	30	61
NO12CM	*Norfolk*	Granby St Multimodal Comprehensive Study (Bayview to Ocean View)	31	$150,000	*No Ranking*	*No Ranking*	32	31	63
NO13CM	*Norfolk*	Granby St Multimodal Comprehensive Study (Taussig to Bayview)	31	$150,000	*No Ranking*	*No Ranking*	33	32	65
107414	*Gloucester County*	Roaring Springs Road (Rt. 616) Shared Use Path	34	$1,234,077	*No Reduction*	*No Reduction*	34	34	68
GC3CM	*Gloucester County*	Rt. 17 Court House Shared Use Path	34	$625,980	*No Reduction*	*No Reduction*	35	35	70
JC1CM	*James City County*	Richmond Road Sidewalk Improvements	34	$150,000	*No Reduction*	*No Reduction*	36	36	72
SU1CM	*Suffolk*	Suburban Drive Sidewalk	34	$500,000	*No Reduction*	*No Reduction*	37	37	74
CH4CM	*Chesapeake*	Kempsville Rd/Battlefield Blvd Intersection Improvement	38	$836,000	*Increase*	*Increase*	38	38	76
Totals				$30,300,990					

[1]The Composite Score is computed as follows:
First, projects are evaluated for their estimated impacts on the reduction of VOC's and NOx.
Second, projects are sorted in ascending order based on the Cost/Benefit for VOC reduction and numbered sequentially. Lower numbers are better.
Third, projects are sorted in ascending order based on the Cost/Benefit for NOx reduction and numbered sequentially. Lower numbers are better.
Finally, the sequential numbers for VOC reduction and NOx reduction are added together to produce the Composite Score. Lower numbers are better.
The Cost-Effectiveness figures represent $/ton of pollutants (NOx, VOC) removed based on the annualized cost of the project.

CMAQ Project Selection and Funding Allocations

During the February 16, 2023 meeting, the HRTPO Board approved the following actions regarding CMAQ funding for FY 2029:

- Twelve current CMAQ projects were selected to receive a total of $13.7 million in FY 2029 funding.
- Four new CMAQ projects were selected to receive a total of $1.3 million in FY 2029 funding.

The approved CMAQ projects are listed in Table 5 and summarized individually below. Map 1 on Page 22 displays the geographic location of the FY 2029 CMAQ allocations where feasible.

Table 5 | ***FY-2029 Allocations to Previously Approved and New CMAQ Projects***

#	ID/UPC #	Jurisdiction	Project Description	Proposed Allocations FY - 29
Previously Approved Projects				
1	115369	*Chesapeake*	Citywide Traffic Signal System Upgrade	* $175,000
2	119409	*Chesapeake*	Chesapeake Signal Timing - Phases 1-4	$150,000
3	119246	*Chesapeake*	Citywide Traffic Signal System Upgrade	$250,000
4	119268	*Portsmouth*	Citywide Traffic Signal System Upgrades	$225,000
5	119264	*Chesapeake*	Deep Creek Elementary School Traffic Signal Improvement	* $1,800,000
6	103928	*Port of Virginia*	Green Operator Program	$1,000,000
7	119270	*Chesapeake*	Battlefield Blvd/Johnstown Rd Intersection Improvements	* $1,377,156
8	119269	*Chesapeake*	Centerville Tnpk/Elbow Rd Intersection Improvements	$1,271,000
9	119271	*Chesapeake*	460/58/13 Safety Improvements	$4,913,652
10	119378	*Suffolk*	Wilroy Rd/Progress Rd Intersection	* $400,000
11	115378	*WATA*	Purchase Five (5) Buses	* $1,424,873
12	119266	*Suffolk*	Constance Rd/Wilroy Rd Intersection	* $700,000
New Candidate Projects				
13	NO31CM	*Norfolk*	Citywide Signal Retiming Phase V	$460,000
14	NO5CM	*Norfolk*	26th St/Lafayette Blvd Lane Repurposing	$316,943
15	SU9CM	*Suffolk*	Suffolk Transit Bus Pre-Emption	* $37,800
16	VB1CM	*Virginia Beach*	Corridor Traffic Signal Retiming	$480,000
			FY-29 Mark	$15,361,905
			Total FY-29 Allocations	$14,981,424
			Total Balance Left in Reserve	$380,481

*** Project is fully funded with the proposed FY 2029 allocation.**

Allocations to Previously Approved CMAQ Projects

1. **Citywide Traffic Signal System Upgrade (UPC 115369) – Chesapeake**
    - This project entails additional enhancements to the citywide traffic signal system to include ongoing technology upgrades to share real time data and provide improved operational efficiencies of central system upgrades, Intelligent Transportation System (ITS) elements, and local intersections operations.
    - Allocated $175,000 in FY 2029 CMAQ funds to fully fund the project.

2. **Chesapeake Signal Timing – Phases 1-4 (UPC 119409) – Chesapeake**
    - The project entails the analysis and development of new signal timings for strategic corridors and isolated intersections in the City of Chesapeake.
    - Allocated $150,000 in FY 2029 CMAQ funds.
    - Future remaining CMAQ funding request: $150,000.

3. **Citywide Traffic Signal System Upgrade (UPC 119246) – Chesapeake**
    - This project entails ongoing enhancements to the Citywide traffic signal system in Chesapeake to maintain internal City operations as well as regional data sharing opportunities.
    - Allocated $250,000 in FY 2029 CMAQ funds.
    - Future remaining CMAQ funding request: $500,000.

4. **Citywide Traffic Signal System Upgrades (UPC 119268) – Portsmouth**
    - This project entails the design and construction of central traffic signal control system upgrades, Intelligent Transportation System (ITS) elements, and local intersection operations/equipment upgrades.
    - Allocated $225,000 in FY 2029 CMAQ funds.
    - Future remaining CMAQ funding request: $450,000.

5. **Deep Creek Elementary School Traffic Signal Improvement (ID# CH4CM) – Chesapeake**
    - The project entails constructing a traffic signal and modifying internal access along Forehand Drive and Margaret Booker Drive to allow safe ingress and egress to Deep Creek Elementary and High schools.
    - Allocated $1,800,000 in FY 2029 CMAQ funds to fully fund the project

6. **Green Operator Program (UPC 103928) – Virginia Port Authority**
    - This project entails continuation of the Port's dray truck replacement program and also Transportation Demand Management efforts to incentivize the modal shift to move cargo from a single truck to a barge or train.
    - Allocated $1,000,000 in FY 2029 CMAQ funds.
    - Future remaining CMAQ funding request: $2,000,000.

7. **Battlefield Boulevard/Johnstown Road Intersection Improvements (UPC 119270) – Chesapeake**
    - This project entails the addition of through lanes and modified signal phasing at the Battlefield/Johnstown/Mt. Pleasant intersection and the implementation of an unsignalized continuous green T concept at the intersection of Mt. Pleasant Road and Woodford Drive.
    - Allocated $1,377,156 in FY 2029 CMAQ funds to fully fund the project.

8. **Centerville Turnpike/ Elbow Road Intersection Improvements – (UPC 119269) – Chesapeake**
    - This project entails widening the southbound approach of the intersection to include an additional through lane and an exclusive right-turn lane as well and widening the westbound approach to include dual left-turn lanes.
    - Allocated $1,271,000 in FY 2029 CMAQ funds.
    - Future remaining CMAQ funding request: $2,271,000.

9. **460/58/13 Safety Improvements – (UPC 119271) – Chesapeake**
    - The proposed project entails addressing systemic safety concerns along the 460/58/13 corridor by installing a system of Restricted Crossing U-Turns (RCUTs) since the present configuration of the existing roadway has excessive access for a roadway that functions like a freeway.
    - Allocated $4,913,652 in FY 2029 CMAQ funds.
    - Future remaining CMAQ funding request: $4,913,652.

10. **Wilroy Road/Progress Road Intersection – (UPC 119378) – Suffolk**
    - This project entails construction of intersection improvements including new signal equipment, turn lane additions, and improvements and retiming the traffic signal.
    - Allocated $400,000 in FY 2029 CMAQ funds to fully fund the project.

11. **Five (5) Bus Purchase Replacement (UPC 115378) – Williamsburg Area Transit Authority (WATA)**
    - The project entails the purchase of five (5) ultra-low sulfur diesel buses to replace existing rolling stock reaching the end of its service life.
    - Allocated $1,424,873 in FY 2029 CMAQ funds to fully fund the project.

12. **Constance Road/Wilroy Road Intersection– (UPC 119266) – Suffolk**
    - The project entails construction of intersection improvements including new signal equipment, turn lane additions, and improvements and retiming the traffic signal.
    - Allocated $700,000 in FY 2029 CMAQ funds to fully fund the project.

Allocations to New CMAQ Projects

13. Citywide Signal Retiming Phase V (ID# NO31CM) – Norfolk

- This project entails retiming 96 intersections within three systems throughout the City of Norfolk.
- Allocated $460,000 in FY 2029 CMAQ funds.
- Future remaining CMAQ funding request: $220,000.

14. 26th Street/Lafayette Boulevard Lane Repurposing (ID# NO5CM) – Norfolk

- This project entails repurposing the existing outside lanes along the corridors to create a safe cycling option along a heavily traveled routes connecting Lafayette neighborhoods to Tidewater Drive. This repurposing will also create shorter pedestrian crossing distances and improve safety for the residents in this area. This project will also increase bike and pedestrian safety by eliminating left-turns shared within a thru-lane.
- Allocated $316,943 in FY 2029 CMAQ funds.
- Future remaining CMAQ funding request: $1,791,708.

15. Suffolk Transit Bus Pre-Emption (ID# SU9CM) – Suffolk

- The project entails installation of hardware on Suffolk Transit buses allowing the vehicles to communicate with the City's traffic signal system for signal pre-emption for transit operations.
- Allocated $37,800 in FY 2029 CMAQ funds to fully fund the project.

16. Corridor Traffic Signal Retiming (ID# VB1CM) – Virginia Beach

- This project entails retiming 96 intersections within four coordinated systems. The signal retiming process will include collecting traffic volume data and existing signal timings, updating vehicular and pedestrian clearance intervals, developing optimized timing plans and time-of-day schedules.
- Allocated $480,000 in FY 2029 CMAQ funds.
- Future remaining CMAQ funding request: $480,000

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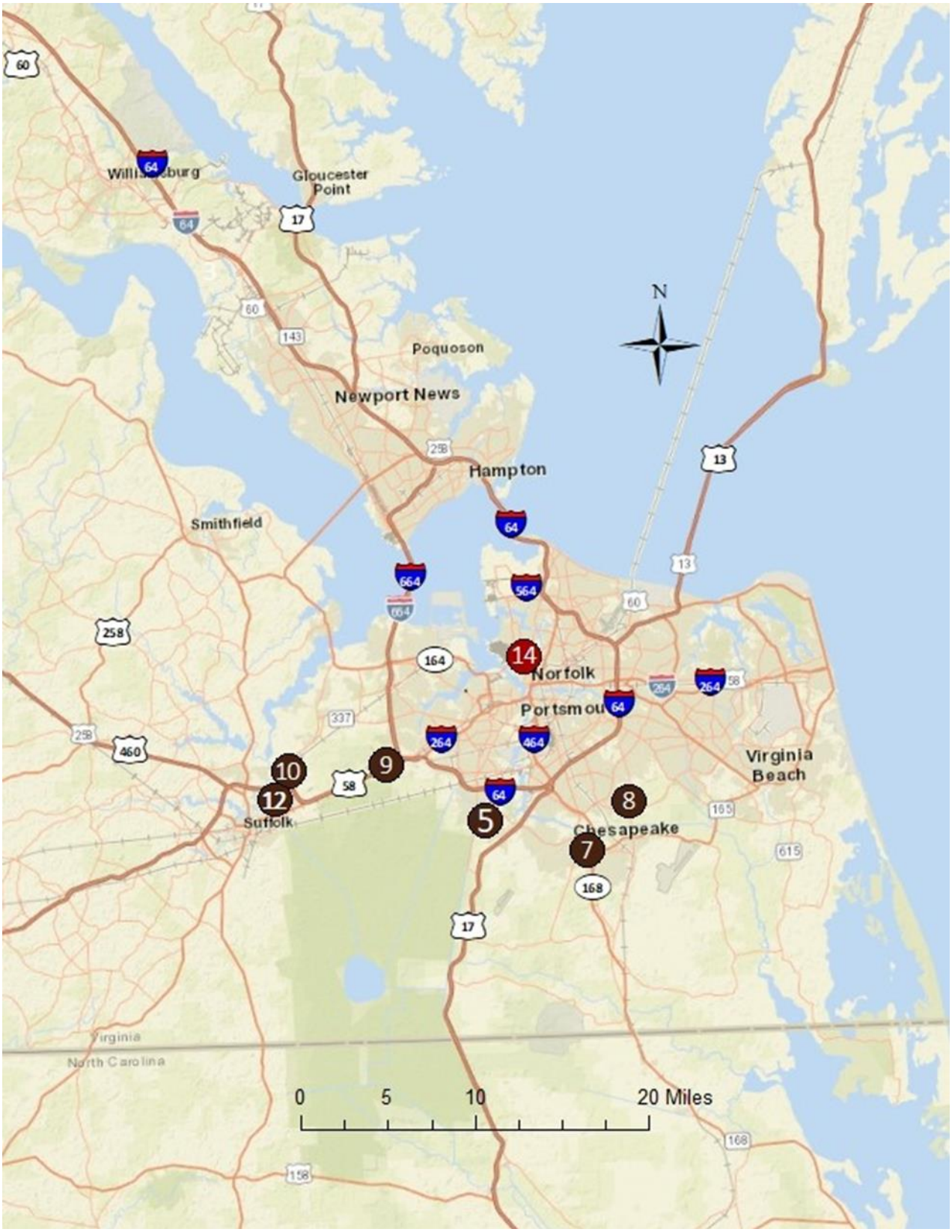
Map 1 | ***Projects Selected for CMAQ Allocations (See next page for legend)***



Projects Selected for CMAQ Allocations

Mapped Projects

- 5 Deep Creek Elementary School Traffic Signal Improvement - Chesapeake
- 7 Battlefield Blvd/Johnstown Road Intersection Improvements - Chesapeake
- 8 Centerville Turnpike/Elbow Road Intersection Improvements - Chesapeake
- 9 460/58/13 Safety Improvements - Chesapeake
- 10 Wilroy Road/Progress Road Intersection - Suffolk
- 12 Constance Road/Wilroy Road Intersection - Suffolk
- 14 26th Street/Lafayette Boulevard Lane Repurposing - Norfolk

Unmapped Projects

- 1 Citywide Traffic Signal System Upgrade - Chesapeake
- 2 Chesapeake Signal Timing Phases 1-4 - Chesapeake
- 3 Citywide Traffic Signal System Upgrade - Chesapeake
- 4 Citywide Traffic Signal System Upgrades - Portsmouth
- 6 Green Operator Program - Virginia Port Authority
- 11 Purchase Five (5) Buses - WATA
- 13 Citywide Signal Retiming Phase V - Norfolk
- 15 Suffolk Transit Bus Pre-Emption - Suffolk
- 16 Corridor Traffic Signal Retiming - Virginia Beach

Project Selection Status

- Previously Approved CMAQ Projects
- New CMAQ Projects

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Section IV
RSTP Project Selection

RSTP PROJECT SELECTION

Projects selected for funding with Regional Surface Transportation Program (RSTP) funds must meet certain criteria originally developed in 1992 and subsequently reviewed and revised. Details on the policies, procedures, and analysis methodologies used for RSTP project selection are included in the ***Guide to the HRTPO CMAQ and RSTP Project Selection Process***, which may be accessed on the HRTPO website at http://www.hrtpo.org/page/cmaq-and-rstp.

To help ensure that all of the necessary information is included with each project proposal, and to provide uniformity to the way that project information is submitted, HRTPO staff developed application forms to be utilized for the submission of RSTP project proposals. The ***RSTP Candidate Project Application Forms*** may be accessed on the HRTPO website at http://www.hrtpo.org/page/cmaq-and-rstp.

Prior to considering new projects to receive RSTP allocations, the status of current projects is reviewed to determine whether additional funding is required to allow for the completion of a project or project phase. The review of previously approved projects also includes determining whether those projects are progressing on schedule or whether funds should be:

1. Reallocated to correspond with updated phase schedules, or
2. Reallocated to other projects.

After addressing the needs of previously approved RSTP projects, new candidate projects to receive available RSTP funding were considered. **Table 6** shows all new projects proposed for RSTP funding during the project selection process in 2022. As shown in the table, 31 candidate projects, with a total request of $474.7 million, were submitted.

In an effort to continually improve the quantitative nature of the HRTPO CMAQ and RSTP Project Selection Process, the Transportation Technical Advisory Committee (TTAC) recommended during the meeting of March 2, 2016 that the HRTPO Project Prioritization Tool (https://www.hrtpo.org/page/project-prioritization/) be used to evaluate highway-type RSTP projects and to continue to use the previous RSTP methodologies to evaluate non-highway RSTP projects since the HRTPO Prioritization Tool at that time was not capable of evaluating most non-highway type projects. The HRTPO Board approved this change to the Project Selection Process on March 17, 2016.

Subsequently, the HRTPO Project Prioritization Tool has been further enhanced to evaluate all types of RSTP project applications, and therefore this application cycle was the first time that the regional prioritization tool was employed to score and rank all project submissions. **Table 7** shows the final scoring and ranking of the 31 RSTP candidate projects.

Table 6 | 2022 RSTP New Candidate Projects

Number	Code	Applicant	Project Name (HRTPO Prioritization Tool ID)	Total Cost	Total RSTP Request	Total FY-29 Request
Highway: Utilizing HRTPO Prioritization Tool						
Roadway Widening						
1	CH2RS	Chesapeake	Centerville Turnpike Widening	$ 236,291,790	$ 236,291,790	$ 13,523,880
2	CH6RS	Chesapeake	Military Hwy Safety Improvements and Access Management	$ 1,704,896	$ 1,704,896	$ 300,000
3	IW1RS	Isle of Wight County	Route 17 Widening at Smiths Neck Road	$ 12,256,133	$ 12,256,133	$ 1,184,926
4	IW3RS	Isle of Wight County	Broadwater Road Recoinstruction Phase I	$ 5,000,000	$ 5,000,000	$ 683,000
5	IW4RS	Isle of Wight County	Rt. 644 Turner Drive Reconstruction	$ 5,624,000	$ 5,624,000	$ 818,000
6	JC1RS	James City County	I-64 Peninsula Widening Segment 4	$ 250,000,000	$ 45,000,000	$ 26,000,000
7	SU3RS	Suffolk	Wilroy Rd Widening from Route 58 Ramp to the Nansemond Flyover	$ 9,050,000	$ 9,050,000	$ 550,000
8	SU8RS	Suffolk	Route 460 Corridor Improvements	$ 15,200,000	$ 6,500,000	$ 450,000
9	VB1RS	Virginia Beach	Laskin Road Phase I-B	$ 42,917,628	$ 40,638,647	$ 2,392,860
Interchange/Intersection						
10	CH1RS	Chesapeake	Rt 17/460 Intersection Improvement	$ 12,223,283	$ 12,223,283	$ 10,284,444
11	CH4RS	Chesapeake	Kempsville Rd/Battlefield Blvd Intersection Improvement	$ 9,297,666	$ 9,297,666	$ 1,078,000
12	CH5RS	Chesapeake	Military Hwy Near Bainbridge Blvd Safety Improvement	$ 2,068,188	$ 2,068,188	$ 300,000
13	IW2RS	Isle of Wight County	Route 17 and Sugar Hill Road Intersection Improvement	$ 3,070,691	$ 3,070,691	$ 415,084
14	JC2RS	James City County	Rt. 30 and Barnes Road Turn Lane Improvement	$ 4,163,600	$ 4,163,600	$ 532,000
15	SU5RS	Suffolk	Portsmouth Blvd/Suburban Dr Intersection Improvements	$ 2,290,000	$ 2,290,000	$ 370,000
Active Transportation						
16	107414	Gloucester County	Roaring Springs Road (Rt. 616) Shared Use Path	$ 12,811,210	$ 9,821,210	$ 1,234,000
17	GC2RS	Gloucester County	Rt. 17 Court House Shared Use Path	$ 7,705,785	$ 7,705,785	$ 625,980
18	110627	Gloucester County	Rt. 17 Gloucester Point Shared Use Path	$ 15,203,285	$ 15,203,285	$ 5,685,739
19	NN1RS	Newport News	Birthplace of America Trail: Pocahontas Trail at Green Mtn Pkwy to Warwick Blvd at Falls Reach	$ 9,878,000	$ 9,878,000	$ 2,298,000
20	NO10RS	Norfolk	Military Highway at Poplar Hall Shared Use Path	$ 9,245,556	$ 9,245,556	$ 488,828
Alternatives Analysis and Feasiblilty Studies						
21	CH3RS	Chesapeake	Centerville Turnpike Widening Study	$ 3,254,000	$ 3,254,000	$ 3,254,000
22	CH7RS	Chesapeake	Pleasant Grove Parkway Alignment Study	$ 2,850,000	$ 2,850,000	$ 2,850,000
23	NO2RS	Norfolk	Downtown Norfolk/Market St/St. Paul's Comprehensive Study	$ 2,500,000	$ 2,500,000	$ 1,250,000
24	NO7RS	Norfolk	Granby St Multimodal Comprehensive Study (Taussig to Bayview)	$ 300,000	$ 300,000	$ 150,000
Systems/Demand Management						
25	NO1RS	Norfolk	Citywide Signal Retiming	$ 680,000	$ 680,000	$ 460,000
26	NO4RS	Norfolk	Citywide Fiber Upgrades	$ 5,997,810	$ 5,997,810	$ 230,700
27	SU4RS	Suffolk	Citywide Traffic Signal System Timing	$ 910,000	$ 910,000	$ 490,000
28	SU6RS	Suffolk	Route 58 ITS Sensors	$ 3,200,000	$ 3,200,000	$ 750,000
Transit: Utilizing HRTPO Prioritization Tool						
New or Expanded Service, Passenger Facilities, HS/intercity/& light rail, Station Development, Vehicle Upgrades etc.						
29	SU1RS	Suffolk	Suffolk Transit Digital Bus Stop Signage	$ 1,000,000	$ 1,000,000	$ 1,000,000
30	SU2RS	Suffolk	Suffolk Transit Bus Pre-Emption	$ 37,800	$ 37,800	$ 37,800
Vehicle Replacement/Purchase						
31	SU7RS	Suffolk	Low or No Emission Replacement Bus and Charging Infrastructure	$ 6,933,075	$ 6,933,075	$ 3,466,537
TOTAL				**$ 693,664,396**	**$ 474,695,415**	**$ 83,153,778**

Applicant	Project Name	Total Cost	Total FY-29 Request	
Previously Approved Projects				
HRT	TRAFFIX Program	$ 5,000,000	$ 1,000,000	
HRT	Bus Vehicle Replacement	$ 39,071,313	$ 19,086,714	
Virginia Beach	Laskin Road Phase III	$ 31,503,154	$ 4,965,715	
York County	Route 17 Widening Between Route 630 and Route 173		$ 3,050,000	
			$ 28,102,429	
New Applications: Utilizing HRTPO Prioritization Tool				**Score (Max =300)**
Newport News	Birthplace of America Trail: Pocahontas Trail at Green Mountain Parkway to Warwick Boulevard at Falls Reach	$ 9,878,000	$ 2,298,000	**212**
Norfolk	Citywide Signal Retiming	$ 680,000	$ 460,000	**200**
Norfolk	Citywide Fiber Upgrades	$ 5,997,810	$ 230,700	**183**
Chesapeake	Centerville Turnpike Widening Study	$ 3,254,000	$ 3,254,000	**169**
Isle of Wight County	Route 17 Widening at Smiths Neck Road	$ 12,256,133	$ 1,184,926	**169**
Chesapeake	Pleasant Grove Parkway Alignment Study	$ 2,850,000	$ 2,850,000	**164**
Suffolk	Citywide Traffic Signal System Timing	$ 910,000	$ 490,000	**162**
Norfolk	Downtown Norfolk/Market Street/St. Paul's Comprehensive Study	$ 2,500,000	$ 1,250,000	**160**
Chesapeake	Kempsville Road/Battlefield Boulevard Intersection Improvement	$ 9,297,666	$ 1,078,000	**158**
James City County	I-64 Peninsula Widening Segment 4	$ 250,000,000	$ 26,000,000	**157**
Chesapeake	Military Highway Near Bainbridge Boulevard Safety Improvement	$ 2,068,188	$ 300,000	**150**
Norfolk	Military Highway at Poplar Hall Shared Use Path	$ 9,245,556	$ 488,828	**150**
Virginia Beach	Laskin Road Phase I-B	$ 42,917,628	$ 2,392,860	**148**
Chesapeake	Military Highway Safety Improvements and Access Management	$ 1,704,896	$ 300,000	**145**
Chesapeake	Rt 17/460 Intersection Improvement	$ 12,223,283	$ 10,284,444	**144**
Gloucester County	Rt. 17 Gloucester Point Shared Use Path	$ 15,203,285	$ 5,685,739	**144**
Suffolk	Route 460 Corridor Improvements	$ 15,200,000	$ 450,000	**141**
Gloucester County	Roaring Springs Road (Route 616) Shared Use Path	$ 12,811,210	$ 1,234,000	**140**
Gloucester County	Route 17 Court House Shared Use Path	$ 7,705,785	$ 625,980	**130**
Suffolk	Route 58 ITS Sensors	$ 3,200,000	$ 750,000	**126**
Suffolk	Suffolk Transit Digital Bus Stop Signage	$ 1,000,000	$ 1,000,000	**126**
Norfolk	Granby Street Multimodal Comprehensive Study (Taussig to Bayview)	$ 300,000	$ 150,000	**122**
Suffolk	Portsmouth Boulevard/Suburban Drive Intersection Improvements	$ 2,290,000	$ 370,000	**120**
James City County	Route 30 and Barnes Road Turn Lane Improvement	$ 4,163,600	$ 532,000	**113**
Suffolk	Low or No Emission Replacement Bus and Charging Infrastructure	$ 6,933,075	$ 3,466,537	**106**
Suffolk	Suffolk Transit Bus Pre-Emption	$ 37,800	$ 37,800	**104**
Isle of Wight County	Route 644 Turner Drive Reconstruction	$ 5,624,000	$ 818,000	**97**
Isle of Wight County	Broadwater Road Recoinstruction Phase I	$ 5,000,000	$ 683,000	**95**
Isle of Wight County	Route 17 and Sugar Hill Road Intersection Improvement	$ 3,070,691	$ 415,084	**95**
Chesapeake	Centerville Turnpike Widening (1)	$ 236,291,790	$ 13,523,880	**Ineligible**
Suffolk	Wilroy Road Widening from Route 58 Ramp to the Nansemond Flyover (1)	$ 9,050,000	$ 550,000	**Ineligible**
		$ 693,664,396	**$ 83,153,778**	

Project Dual Funded with CMAQ funds

(1) Project not eligible for RSTP funding due to not being included the region's currently approved Long Range Transportation Plan

(2) Only new candidate projects were scored for FY 2029 RSTP funding consideration

RSTP PROJECT SELECTION AND FUNDING ALLOCATIONS

During the February 16, 2023 meeting, the HRTPO Board approved the following actions regarding RSTP funding for FY 2029:

- Four current RSTP projects were selected to receive a total of $20.2 million in FY 2029 funding.
- Twelve new RSTP projects were selected to receive a total of $11.6 million in FY 2029 allocations.

The approved RSTP projects are listed in Table 8 and are summarized individually below. Map 2 on Page 32 displays the geographic location of the FY 2029 RSTP allocations where feasible.

Table 8 | FY 2029 Allocations to New and Previously Approved RSTP Projects

#	ID/UPC #	Jurisdiction	Project Description	Proposed Allocations FY - 29
Previously Approved Projects				
1	T14104	*HRT*	TRAFFIX Program	$1,000,000
2	T16054	*HRT*	Bus Vehicle Replacement	$9,543,357
3	119275	*Virginia Beach*	Laskin Rd Phase III	$4,965,715
4	111787	*York County*	Route 17 Widening Between Route 630 and Route 173	* $4,690,000
New Candidate Projects				
5	NN1RS	*Newport News*	Birthplace of America Trail: Pocahontas Trail at Green Mtn Pkwy to Warwick Blvd at Falls Reach	$2,298,000
6	NO4RS	*Norfolk*	Citywide Fiber Upgrades	$230,700
7	CH3RS	*Chesapeake*	Centerville Tnpk Widening Study	$1,627,000
8	IW1RS	*Isle of Wight County*	Route 17 Widening at Smiths Neck Rd	$1,184,926
9	CH7RS	*Chesapeake*	Pleasant Grove Pkwy Alignment Study	$1,425,000
10	SU4RS	*Suffolk*	Citywide Traffic Signal System Timing	$490,000
11	NO2RS	*Norfolk*	Downtown Norfolk/Market St/St. Paul's Comprehensive Study	$1,250,000
12	CH5RS	*Chesapeake*	Military Hwy Near Bainbridge Blvd Safety Improvement	$300,000
13	NO10RS	*Norfolk*	Military Hwy at Poplar Hall Dr Shared Use Path	$448,828
14	VB1RS	*Virginia Beach*	Laskin Rd Phase I-B	$2,392,860
15	CH1RS	*Chesapeake*	Rt 17/460 Intersection Improvement	$1,028,440
16	110627	*Gloucester County*	Rt. 17 Gloucester Point Shared Use Path	$4,185,739
			FY-29 Mark	$37,078,513
			Total FY-29 Allocations	$37,060,565
			Total Balance Left in Reserve	$17,948

*** Project is fully funded with the proposed FY 2029 allocation.**

Allocations to Previously Approved RSTP Projects

1. **TRAFFIX (UPC T14104) – Hampton Roads Transit (HRT)**
    - This project entails the continued funding of the regional Transportation Demand Management (TDM) program.
    - Allocated $1,000,000 in FY 2029 RSTP funds.
    - Future remaining RSTP funding request: $4,000,000.

2. **Bus Vehicle Replacement (UPC T16054) – HRT**
    - The project entails purchasing (29, 35, and 40 foot) buses to replace similar vehicles that have reached the end of their service life. The new buses will have improved fuel economy and performance, lower operating costs, and lower emissions than the buses they will replace.
    - Allocated $9,543,357 in FY 2029 RSTP funds.
    - Future remaining RSTP funding request: $9,543,357.

3. **Laskin Road Phase III (UPC 119275) – Virginia Beach**
    - This project entails widening of Laskin Road between Phillip Avenue to Republic Road from 4 lanes to 6 lanes, removal of service/ feeder roads, addition of pedestrian signals and crossings to all signalized intersections, addition of directional median at Phillip Avenue and Laskin Road intersection, and addition of sidewalk and multi-use path.
    - Allocated $4,965,715 in FY 2029 RSTP funds.
    - Future remaining RSTP funding request: $18,466,550.

4. **Route 17 Widening Between Route 630 and Route 173 (UPC 111787) – York County**
    - The project entails widening Route 17 (George Washington Memorial Highway) from 4 to 6 lanes between just north of Wolf Trap Road (1.52 miles north of Route 620) and Route 173 (Denbigh Boulevard/Goodwin Neck Road).
    - Allocated $4,690,000 in FY 2029 RSTP funds to fully fund the project.

Allocations to New RSTP Projects

5. **Birthplace of America Trail: Pocahontas Trail at Green Mtn Parkway to Warwick Boulevard at Falls Reach (ID# NN1RS) – Newport News**
    - This project entails construction of an approximate 1.4-mile section of 10-foot shared use path to be constructed parallel to Pocahontas Trail roadway to serve pedestrians, bicyclists, and other non-motorized traffic between Newport News and James City County.
    - Allocated $2,298,000 in FY 2029 RSTP funds.
    - Future remaining RSTP funding request: $7,580,000.

6. **Citywide Fiber Upgrades (ID# NO4RS) – Norfolk**
    - The project entails evaluation of the existing fiber communications network performance and susceptibility to network connectivity failure, identifying high

risk locations and strategies for mitigating risk of network failure, and implementing measures that maximize performance and build redundancy into the existing communications network.
- Allocated $230,700 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $5,767,110.

7. Centerville Turnpike Widening Study (ID# CH3RS) -- Chesapeake
- The project entails developing the Centerville Turnpike Widening project to 30% plans for the proposed expansion of the corridor to four-lanes from Mt. Pleasant Road to Elbow Road including the replacement of the Centerville Turnpike Bridge within the project limits and also obtaining a National Environmental Policy Act document for this project.
- Allocated $1,627,000 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $1,627,000.

8. Route 17 Widening at Smiths Neck Road (ID# IW1RS) – Isle of Wight County
- The project entails widening the southbound lanes of Route 17 between the James River Bridge and the Route 17/ Smiths Neck Road intersection, providing a third travel lane in the southbound direction and a continuous right turn lane at the Route 17 / Smiths Neck Road intersection.
- Allocated $1,184,926 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $11,071,207.

9. Pleasant Grove Parkway Alignment Study (ID# CH7RS) – Chesapeake
- The project entails development an alternative analysis and feasibility report for the proposed Pleasant Grove Parkway, including conceptual design criteria, development of roadway and bridge design alternatives, screening and analysis of the alternatives, review of potential environmental impacts, traffic analyses, preliminary sequence of construction, preliminary drainage and storm water management design, public and private utility coordination, geotechnical analysis, public involvement and coordination meetings.
- Allocated $1,425,000 in FY 2029 RSTP funds to fully fund the project.
- Future remaining RSTP funding request: $1,425,000.

10. Citywide Traffic Signal System Timing (ID# SU4RS) – Suffolk
- The project entails the development and implementation of signal timing plans for coordinated traffic signal systems throughout the City of Suffolk.
- Allocated $490,000 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $420,000.

11. Downtown Norfolk/Market Street/St. Paul's Comprehensive Study (ID# NO2RS) – Suffolk
- The project entails the study of potential traffic flow impacts as a result of the potential removal of the I-264/Market Street ramp, evaluating potential multimodal connections to reconnect adjacent areas to the downtown and Harbor

Park areas that will open up as a result of the removal.

- Allocated $1,250,000 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $1,250,000.

12. Military Highway near Bainbridge Boulevard Safety Improvement (ID# CH5RS) – Chesapeake

- The project entails implementation of a system of strategies targeted to improve vehicle safety to reduce the number and severity of crashes at this interchange, including construction of a Restricted Crossing U-Turn (RCUT) at a median opening east of interchange, adding a new left turn lane, and installation of improved advance street name/guidance signs, railroad crossing activated flashing beacon warnings, and Intelligent Transportation System Dynamic Message Signage.
- Allocated $300,000 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $1,768,188.

13. Military Highway at Poplar Hall Drive Shared Use Path (ID# NO10RS) – Norfolk

- The project entails constructing a 12-foot wide asphalt shared use path along the west side of Military Highway from the existing sidewalk terminus of the Curlew Drive overpass over I-264 to Poplar Hall Drive, constructing a 8-foot wide concrete sidewalk along the south side of Poplar Hall drive from the new shared use path to the existing shared use path terminus in the median of Poplar Hall Drive, and other related safety enhancements in the area.
- Allocated $448,828 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $8,716,728.

14. Laskin Road Phase I-B (ID# VB1RS) – Virginia Beach

- The project entails the elimination of the unsafe and confusing bi-directional frontage roads on both sides of Laskin Road from Red Robin Road to Oriole Drive and widen the 4-lane plus frontage road facility to a traditional 6-lane divided facility with a raised median and accommodations for bicycles, sidewalks, and a shared-use path.
- Allocated $2,392,860 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $38,245,787.

15. Route 17/460 Intersection Improvement (ID# CH1RS) – Chesapeake

- The project addresses the safety issues at the signalized intersection of Military Highway and George Washington Highway by partially displacing the left turns from east bound and west bound Military Highway to reduce left-turning crossing distances.
- Allocated $1,028,440 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $11,194,839.

16. Route 17 Gloucester Point Shared Use Path (ID# GC3RS) – Gloucester County

- The project entails constructing a buffered 10 foot wide shared use path along the eastside of Route 17 from Farmwood Road to Guinea Road.

- Allocated $4,185,739 in FY 2029 RSTP funds.
- Future remaining RSTP funding request: $11,017,546.

Map 2 | ***Projects Selected for RSTP Allocations (See next page for legend)***

Projects Selected for RSTP Allocations

Mapped Projects

- 3 Laskin Road Phase III - Virginia Beach
- 4 Route 17 Widening Between Route 630 and Route 173 - York County
- 5 Birthplace of America Trail Between Pocahontas Trail to Warwick Boulevard - Newport News
- 8 Route 17 Widening at Smiths Neck Road - Isle of Wight County
- 12 Military Highway at Bainbridge Boulevard Safety Improvement - Chesapeake
- 13 Military Highway at Poplar Hall Drive Shared Use Path - Norfolk
- 14 Laskin Road Phase I-B
- 15 Route 17/460 Intersection Improvement - Chesapeake
- 16 Route 17 Gloucester Point Shared Use Path - Gloucester County

Unmapped Projects

- 1 TRAFFIX Transportation Demand Management Program - HRT
- 2 Bus Vehicle Replacement - HRT
- 6 Citywide Fiber Upgrades - Norfolk
- 7 Centerville Turnpike Widening Study - Chesapeake
- 9 Pleasant Grove Parkway Alignment Study
- 10 Citywide Traffic Signal System Timing - Suffolk
- 11 Downtown Norfolk/Market St/St. Paul's Comprehensive Study - Norfolk

Project Selection Status

- Previously Approved RSTP Projects
- New RSTP Projects

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Section V
Appendices

APPENDIX A

CMAQ Project Evaluation Worksheets

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Gloucester (locality/agency)

PROJECT NAME: **Roaring Springs Road (Rte. 616) Shared Use Path**

LOCATION: East side of Roaring Springs Road from Rt.17B to Beaverdam Park

DESCRIPTION: A buffered 6' sidewalk from Rt. 17B to Wyncote from Wyncote to Beaverdam Park a buffered 10' shared use path.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $12,811,210

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* [9] project	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
BG 1 CT 1002.03	0	0	0
BG 3 CT 1002.03	0	0	
BG 1 CT 1002.01	0	0	
total	0	0	0

Alternative mode commuters "without" proposed improvement (above) 0

Increase due to proposed improvement [3] **60%**

New alternative mode commuters (product) 0

Factor for roundtrips 2

Auto trip reduction [4] (product) 0 per day

Average length of auto trip replaced (one-way) 5 mi.[7]

VMT reduction (product) 0 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	0	0.325933	0	0	0.008267	0	0
NOx	0	0.255832	0	0	0.048618	0	0

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	0	0.001	250	30	0.001102	0.000	**#DIV/0!**
NOx	0	0.001	250	30	0.001102	0.000	**#DIV/0!**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent to": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

PEDESTRIAN IMPROVEMENTS

APPLICANT: Gloucester (locality/agency)

PROJECT NAME: **Greate Road Sidewalk**

LOCATION: Along the west side of Greate Road from Lafayette Heights to the end of Greate Road where it connects with route 17.

DESCRIPTION: A buffered 6' wide sidewalk that will extend the length of Greate Road. Additionally a 140 foot long 6' wide sidewalk to extend along Greate Road West to Route 17.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $2,935,560

2- VMT REDUCTION ESTIMATE

ID, adjacent [9] blockgroups	Existing walk commuters [2]
CT 1003.01, BG 1	31
CT 1003.01, BG 2	53
total	84

Walk commuters "without" pedestrian improvement (above)	84
Increase due to pedestrian improvement [3]	**40%**
New active transportation commuters (product)	34
Factor for roundtrips	2
Auto trip reduction [4] (product)	67 per day
Average length of auto trip replaced (one-way)	5 mi.[7]
VMT reduction (product)	336 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	67	0.325933	21.9	336	0.008267	2.8	24.7
NOx	67	0.255832	17.2	336	0.048618	16.3	33.5

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	24.7	0.001	250	30	0.001102	0.204	**$14,391,158**
NOx	33.5	0.001	250	30	0.001102	0.277	**$10,593,664**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: CMAQ scoring tech update- post-6-17-22 TPS work area.pptx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Gloucester (locality/agency)

PROJECT NAME: **Rt. 17 Gloucester Point Shared Use Path**

LOCATION: Along the east side of Rte. 17 from Farmwood Road to Guinea Road, approximately 1.4 miles

DESCRIPTION: A buffered 10' wide shared use path is poposed to extend the existing sidewalks along the east side of Rt. 17 from Farmwood Road to Guinea Road.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $15,203,285

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* project [9]	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
BG 1 CT 1003.01	15	31	46
BG 2 CT 1003.01	0	53	
BG 4 CT 1003.01	0	0	
BG 1 CT 1004	0	0	
total	15	84	46

Alternative mode commuters "without" proposed improvement (above) 46

Increase due to proposed improvement [3] **60%**

New alternative mode commuters (product) 28

Factor for roundtrips 2

Auto trip reduction [4] (product) 55 per day

Average length of auto trip replaced (one-way) 5 mi.[7]

VMT reduction (product) 276 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	55	0.325933	18	276	0.008267	2	20
NOx	55	0.255832	14	276	0.048618	13	28

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	20	0.001	250	30	0.001102	0.168	**$90,734,492**
NOx	28	0.001	250	30	0.001102	0.228	**$66,791,754**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent to": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Chesapeake (e.g. locality)
PROJECT NAME: **Route 17/460 Intersection Improvement Project**
LOCATION: Intersection of Military Hwy and George Washington Hwy
DATE: 8/31/2022 (application date)
DESCRIPTION: Partially displace left turn lanes from eastbound and westbound Military Hwy.

Key: cell with formula (method of calculation)

1 - COST $12,223,283 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour

Intersection Delay Before Project	51.1	sec/veh [1]
Intersection Delay After Project	28.7	sec/veh [1]
Reduction in Intersection Delay (diff.)	22.40	sec/veh, pk hr
multiplied by	3,602	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	1,186,541	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	1,186,541	2.042	3.2%	78	96.8%	0.03807	44	121
NOx	1,186,541	16.204	3.2%	615	96.8%	0.07919	91	706

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$12,223,283	121	$100,797	907	**$91,422,887**
NOx	$12,223,283	706	$17,309	907	**$15,698,939**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Chesapeake (e.g. locality)
PROJECT NAME: **Cedar Rd/ S Battlefield Blvd Turn Lane**
LOCATION: Intersection of Cedar Rd and S Battlefeild Boulevard
DATE: 8/30/2022 (application date)
DESCRIPTION: This project provides an exclusive southbound right-turn lane to support the existing traffic demand of nearly 500 vehicles during the PM peak.

Key: cell with formula (method of calculation)

1 - COST $2,300,000 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour

Intersection Delay Before Project	51.5	sec/veh [1]
Intersection Delay After Project	37.1	sec/veh [1]
Reduction in Intersection Delay (diff.)	14.40	sec/veh, pk hr
multiplied by	3,265	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	691,412	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	691,412	2.042	3.2%	45	96.8%	0.03807	25	71
NOx	691,412	16.204	3.2%	359	96.8%	0.07919	53	412

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$2,300,000	71	$32,549	907	**$29,521,672**
NOx	$2,300,000	412	$5,589	907	**$5,069,397**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Chesapeake (e.g. locality)
PROJECT NAME: **Volvo Parkway/ Executive Blvd Turn Lane**
LOCATION: Intersection of Volvo Parkway and Executive Boulevard
DATE: 8/30/2022 (application date)
DESCRIPTION: Proposed exclusive northbound right-turn lane enhancements. Additionally includes offsetting the existing left-turn lanes.

Key: cell with formula (method of calculation)

1 - COST $1,820,000 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour

Intersection Delay Before Project	24.9	sec/veh [1]
Intersection Delay After Project	20.6	sec/veh [1]
Reduction in Intersection Delay (diff.)	4.30	sec/veh, pk hr
multiplied by	2,262	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	143,038	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	143,038	2.042	3.2%	9	96.8%	0.03807	5	15
NOx	143,038	16.204	3.2%	74	96.8%	0.07919	11	85

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$1,820,000	15	$124,498	907	**$112,919,546**
NOx	$1,820,000	85	$21,378	907	**$19,390,299**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Chesapeake (e.g. locality)
PROJECT NAME: **Kempsville Rd and Battlefield Blvd Intersection Improvements**
LOCATION: Intersection of Kempsville Road and Battlefield Boulevard
DATE: 8/31/2022 (application date)
DESCRIPTION: Add a channelized westbound right-turn lane on Kempsville Road at Battlefield Blvd for vehicles accessing the southbound Great Bridge Bypass.

Key: cell with formula (method of calculation)

1 - COST $4,127,658 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour

Intersection Delay Before Project	115.9	sec/veh [1]
Intersection Delay After Project	133.6	sec/veh [1]
Reduction in Intersection Delay (diff.)	-17.70	sec/veh, pk hr
multiplied by	5,874	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	-1,528,968	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	-1,528,968	2.042	3.2%	-100	96.8%	0.03807	-56	-156
NOx	-1,528,968	16.204	3.2%	-793	96.8%	0.07919	-117	-910

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$4,127,658	-156	-$26,415	907	**-$23,958,261**
NOx	$4,127,658	-910	-$4,536	907	**-$4,114,060**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Gloucester (locality/agency)

PROJECT NAME: **Rt. 17 Court House Shared Use Path**

LOCATION: Along the east side of Rte. 17 from Rte. 17B (Main Street) to Beehive Drive, approximately 0.65 miles.

DESCRIPTION: A buffered 10' wide shared use path is proposed on the east side of Rt. 17 from Rt. 17 B to Beehive Drive.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $7,705,785

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* [9] project	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
BG 2 CT 1002.02	0	0	0
BG 3 CT 1002.03	0	0	
BG 4 CT 1002.03	0	0	
total	0	0	0

Alternative mode commuters "without" proposed improvement (above) 0

Increase due to proposed improvement [3] **60%**

New alternative mode commuters (product) 0

Factor for roundtrips 2

Auto trip reduction [4] (product) 0 per day

Average length of auto trip replaced (one-way) 5 mi.[7]

VMT reduction (product) 0 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	0	0.325933	0	0	0.008267	0	0
NOx	0	0.255832	0	0	0.048618	0	0

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	0	0.001	250	30	0.001102	0.000	**#DIV/0!**
NOx	0	0.001	250	30	0.001102	0.000	**#DIV/0!**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent to": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Gloucester (locality/agency)

PROJECT NAME: **Tidemill Road Shared Use Path**

LOCATION: Along Tidemill Road from Route 17 to Guinea Road

DESCRIPTION: A 10' wide Shared us path along the east side of Tidemill Road along with a pedestrian board walk for safe pasage.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $8,033,023

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* [9] project	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
BG 1 CT 1003.01	15	31	46
BG 4 CT 1003.01	0	0	
BG 1 CT 1005	10	0	
total	25	31	46

Alternative mode commuters "without" proposed improvement (above)	46
Increase due to proposed improvement [3]	**60%**
New alternative mode commuters (product)	28
Factor for roundtrips	2
Auto trip reduction [4] (product)	55 per day
Average length of auto trip replaced (one-way)	5 mi.[7]
VMT reduction (product)	276 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	55	0.325933	18	276	0.008267	2	20
NOx	55	0.255832	14	276	0.048618	13	28

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	20	0.001	250	30	0.001102	0.168	**$47,941,761**
NOx	28	0.001	250	30	0.001102	0.228	**$35,291,037**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent to": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Isle of Wight (e.g. locality)
PROJECT NAME: **Route 17 Widening at Smiths Neck Road**
LOCATION: Intersection of Route17 and Smiths Neck Road along Southbound Route17
DATE: 8/31/2022 (application date)
DESCRIPTION: Provide additional travel lane in the southbound direction of Route 17 and a continuous right turn lane at Route 17 and Smiths Neck Road.

Key: cell with formula (method of calculation)

1 - COST $12,256,133 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour		
Intersection Delay Before Project	228.6	sec/veh [1]
Intersection Delay After Project	170.4	sec/veh [1]
Reduction in Intersection Delay (diff.)	58.20	sec/veh, pk hr
multiplied by	6,403	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	5,480,215	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr [3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr [3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	5,480,215	2.042	3.2%	358	96.8%	0.03807	202	560
NOx	5,480,215	16.204	3.2%	2,842	96.8%	0.07919	420	3,262

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$12,256,133	560	$21,883	907	**$19,847,498**
NOx	$12,256,133	3,262	$3,758	907	**$3,408,169**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Isle of Wight (e.g. locality)
PROJECT NAME: **Route 17 and Sugar Hill Road Intersection Improvements**
LOCATION: Unsignalized intersection of Route 17 and Sugar Hill Road
DATE: 8/31/2022 (application date)
DESCRIPTION: converting the existing inteersection to an unsignalized Continuous Green-T intersection, and an acceleration lane for southbound route 17 movement from Sugar

Key: cell with formula (method of calculation)

1 - COST $3,070,691 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour

Intersection Delay Before Project	2.3	sec/veh [1]
Intersection Delay After Project	1.9	sec/veh [1]
Reduction in Intersection Delay (diff.)	0.40	sec/veh, pk hr
multiplied by	2,815	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	16,559	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	16,559	2.042	3.2%	1	96.8%	0.03807	1	2
NOx	16,559	16.204	3.2%	9	96.8%	0.07919	1	10

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$3,070,691	2	########	907	**$1,645,722,156**
NOx	$3,070,691	10	$311,576	907	**$282,599,827**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

PEDESTRIAN IMPROVEMENTS

APPLICANT: James City Cou (locality/agency)

PROJECT NAME: **Richmond Road Sidewalk Improvements**

LOCATION: South side of Richmond Road from Bush Springs Road to Oakland Drive

DESCRIPTION: A new 5 foot wide sidewalk along Richmond Road, will provide an infill of sidealk between Toano and Norge. Will include various crosswalks, drainage, and culvert improvements and tie into proposed residential development.

DATE: 8/23/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $1,987,920

2- VMT REDUCTION ESTIMATE

ID, adjacent [9] blockgroups	Existing walk commuters [2]
CT 804.02, BG 1	0
CT 804.02, BG 2	0
total	0

Walk commuters "without" pedestrian improvement (above) 0

Increase due to pedestrian improvement [3] 40%

New active transportation commuters (product) 0

Factor for roundtrips 2

Auto trip reduction [4] (product) 0 per day

Average length of auto trip replaced (one-way) 5 mi.[7]

VMT reduction (product) 0 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	0	0.325933	0.0	0	0.008267	0.0	0.0
NOx	0	0.255832	0.0	0	0.048618	0.0	0.0

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	0.0	0.001	250	30	0.001102	0.000	**#DIV/0!**
NOx	0.0	0.001	250	30	0.001102	0.000	**#DIV/0!**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: CMAQ scoring tech update- post-6-17-22 TPS work area.pptx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

PEDESTRIAN IMPROVEMENTS

APPLICANT: James City Cou (locality/agency)
PROJECT NAME: **Jamestown High School Sidewalk Improvements**
LOCATION: Intersection of Route 5, Greensprings Plantation Drive, and Eagle Way.

DESCRIPTION: Proposes a new 5-foot-wide sidewalk along Greensprings Plantation Drive and Eagle Way to connect the Fairway Villas to Jamestown High. Additionally 5 new crosswalks with modifications to signal at Route 5. There will be a 10' shared use path connecting the sidewalk to the trailhead of Greensprings Interpretive Trail.
DATE: 8/2/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $689,030

2- VMT REDUCTION ESTIMATE

ID, adjacent [9] blockgroups	Existing walk commuters [2]
CT 803.07, BG 3	0
CT 803.08, BG 1	13
total	13

Walk commuters "without" pedestrian improvement (above)	13	
Increase due to pedestrian improvement [3]	**40%**	
New active transportation commuters (product)	5	
Factor for roundtrips	2	
Auto trip reduction [4] (product)	10	per day
Average length of auto trip replaced (one-way)	5	mi.[7]
VMT reduction (product)	52	mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	10	0.325933	3.4	52	0.008267	0.4	3.8
NOx	10	0.255832	2.7	52	0.048618	2.5	5.2

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	3.8	0.001	250	30	0.001102	0.032	**$21,826,236**
NOx	5.2	0.001	250	30	0.001102	0.043	**$16,066,796**

Notes:
[1] Standard for civil projects.
[2] Table: B08301 File: CMAQ scoring tech update- post-6-17-22 TPS work area.pptx
[3] Source: TPS (see "alt commute % increase" tab in this workbook)
[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.
[5] From application
[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab
[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)
[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).
[9] "adjacent": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Newport News (locality/agency)

PROJECT NAME: **Birthplace of America Trail: Pocahontas Trail at Green Mtn Pkwy to Warwick Blvd at Falls Reach**

LOCATION: This section of the proposed Birthplace of America Trail (BoAT) starts at Green Mount Parkway and Pocahontas Trail, continues parallel along the Pocahontas Trail and Warwick Blvd roadways, and ends at the intersection of Falls Reach Parkway.

DESCRIPTION: Approximate 1.4 mile section of the BOAT that parallels Pocahontas Trail. A 10' wide shared-use path to serve non motorized traffic between Newport News and James City County.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $9,878,000

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* [9] project	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
BG 1 CT 324	0	10	10
BG 3 CT 324	0	0	
BG 3 CT 801.02	0	14	
total	0	24	10

Alternative mode commuters "without" proposed improvement (above)	10
Increase due to proposed improvement [3]	**60%**
New alternative mode commuters (product)	6
Factor for roundtrips	2
Auto trip reduction [4] (product)	12 per day
Average length of auto trip replaced (one-way)	5 mi. [7]
VMT reduction (product)	60 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	12	0.325933	4	60	0.008267	0	4
NOx	12	0.255832	3	60	0.048618	3	6

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	4	0.001	250	30	0.001102	0.036	**$271,182,605**
NOx	6	0.001	250	30	0.001102	0.049	**$199,623,775**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent to": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

SIGNAL RETIMING

DATE: 9/1/2022 (application date)
APPLICANT: Newport News (e.g. locality)
PROJECT NAME: **Citywide Traffic Signal Retiming**
LOCATION:
DESCRIPTION:

Key: cell with formula (method of calculation)

1 - COST: $500,000

2 - EMISSIONS REDUCTION

		Low Volume Intersections	Medium Volume Intersections	High Volume Intersections	Total # of Intersections
	pm peak hr range:	Less than 3,000 vph	3,000 to 6,000 vph	More than 6,000 vph	
Number of Intersections:		22	14	0	36
multiplied by	pm peak hour volume:	2,000	4,500	10,000 vph [1]	
multiplied by	delay savings:	14	14	14 sec/veh [2]	
divided by	conversion factor:	3,600	3,600	3,600 sec/hr	
divided by	delay K factor:	0.17	0.17	0.17 delay K factor [3]	
multiplied by	weekday equivalents:	300	300	300 days/year (say)	
multiplied by	useful life:	5	5	5 years [5]	
Change in Vehicle Delay:		1,509,804	2,161,765	0 hours	

Total Change in Vehicle Delay (sum of the columns above): 3,671,569 hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[4]	Heavy Duty (HD), % [6]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Light Duty, % (1-HD%)	Emissions Factor, Light Duty Vehs, g/hr[4]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	3,671,569	2.042	3.2%	240	97%	0.038072	135	375
NOx	3,671,569	16.204	3.2%	1,904	97%	0.079186	281	2,185

3 - COST EFFECTIVENESS

Type	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton	Cost Effectiveness, $/ton (product)
VOC	$500,000	375	$1,332	907	**$1,208,560**
NOx	$500,000	2,185	$229	907	**$207,531**

Notes:

[1] Based on range

[2] Pre-project delay 55 seconds * 25% full delay savings = 14 seconds.
(55 seconds: average control delay for LOS D/E, HCM 2000, Table 5)
(25% savings: avg. of 6 studies in *The benefits of retiming traffic signals* [Srinivasa Sunkari, ITE journal, Apr. 2004, p. 26];
article documented 7 studies, but one study's results were outlying)

[3] Portion of daily delay represented by peak hour; assumed not to change significantly over the decades.
Assume pm peak hour is the peak hour of the day.
Source: "Cost Benefit Model for Intersection Level of Service Improvements" (HRPDC, June 1997), pg. 8.

[4] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108) "IntImproveData" sheet filtered:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: 5 (urban street)

[5] Based on recommendation of retiming signals every three to five years (*Traffic Signal Timing Manual* , FHWA, June 2008, section 7.1.2), assume useful life of 5 years.

[6] Trucks, Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

COMPLETE STREETS

APPLICANT: Norfolk (locality/agency)

PROJECT NAME: **26th Street/ Lafayette Blvd Lane Repurposing**

LOCATION: 26th Street/Lafayette Boulevard from Tidewater Drive to Leo Street.

DESCRIPTION: This project would repurpose the existing outside lane in each direction and create a safe cycling option along a heavily traveled corridor connecting Lafayette neighborhoods to Tidewater Drive.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $2,108,651

2- VMT REDUCTION ESTIMATE

Blockgroups with centroids within 2 miles of project	Existing bus commuters [2]	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
81 blockgroups [2]	1,987	439	3,340	5,766
total	1,987	439	3,340	5,766

Alt commuters "without" proposed improvement (above)		5,766
Increase due to proposed improvement [3]		**45%**
	New alt transportation commuters (product)	2,595
Factor for roundtrips		2
	Auto trip reduction [4] (product)	5,189 per day
Average length of auto trip replaced (one-way)		5 mi.[7]
	VMT reduction (product)	25,947 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	5,189	0.325933	1,691	25,947	0.008267	215	1,906
NOx	5,189	0.255832	1,328	25,947	0.048618	1,261	2,589

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	1,906	0.001	250	30	0.001102	15.752	**$133,863**
NOx	2,589	0.001	250	30	0.001102	21.399	**$98,540**

Notes:

[1] Standard for civil projects.

[2] Table: B080301 File: ACSDT5Y2020.B08301_data_with_overlays_2022-07-05T123916.xlsx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

PEDESTRIAN IMPROVEMENTS

APPLICANT: Norfolk (locality/agency)

PROJECT NAME: **E Indian River Rd and East Berkley Ave Pedestrian Improvements**

LOCATION: E Indian River Rd and East Berkley Ave

DESCRIPTION: on the western and southern legs of the intersection, ADA compliant curb ramps, and a median refuge on the western leg

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $710,250

2- VMT REDUCTION ESTIMATE

ID, adjacent [9] blockgroups	Existing walk commuters [2]
CT 51 BG 1	38
CT 51 BG 2	0
CT 50 BG 1	0
CT 50 BG 2	35
total	73

Walk commuters "without" pedestrian improvement (above)	73	
Increase due to pedestrian improvement [3]	**40%**	
New active transportation commuters (product)	29	
Factor for roundtrips	2	
Auto trip reduction [4] (product)	58	per day
Average length of auto trip replaced (one-way)	5	mi. [7]
VMT reduction (product)	292	mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	58	0.325933	19.0	292	0.008267	2.4	21.4
NOx	58	0.255832	14.9	292	0.048618	14.2	29.1

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	21.4	0.001	250	30	0.001102	0.177	**$4,006,567**
NOx	29.1	0.001	250	30	0.001102	0.241	**$2,949,327**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: CMAQ scoring tech update- post-6-17-22 TPS work area.pptx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Norfolk (locality/agency)

PROJECT NAME: **Military Highway at Poplar Hall Drive Shared Use Path**

LOCATION: Military Highway from Poplar Hall to I-264

DESCRIPTION: Constructing a 0.25-mile long 12-foot wide asphalt shared use path along the west side of Military Highway from the existing sidewalk terminus of the Curlew Drive overpass over I-264 to Poplar Hall Drive; constructing a 0.09-mile long 8-foot wide concrete sidewalk along the south side of Poplar Hall Drive from the new shared use path to the existing shared use path terminus in the median of Poplar Hall Drive; closing the unnecessary existing slip ramp on southbound Military Highway; removing the one-way ingress entrance to Best Square that drivers often drive the wrong way on; and other modifications to select commercial entrances.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $9,245,556

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* [9] project	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
BG 1 CT 70.02	0	0	0
BG 2 CT 70.02	0	0	0
BG 2 CT 69.01	0	8	8
total	0	8	8

Alternative mode commuters "without" proposed improvement (above)		8
Increase due to proposed improvement [3]		**60%**
	New alternative mode commuters (product)	5
Factor for roundtrips		2
	Auto trip reduction [4] (product)	10 per day
Average length of auto trip replaced (one-way)		5 mi.[7]
	VMT reduction (product)	48 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	10	0.325933	3	48	0.008267	0	4
NOx	10	0.255832	2	48	0.048618	2	5

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	4	0.001	250	30	0.001102	0.029	**$317,275,000**
NOx	5	0.001	250	30	0.001102	0.040	**$233,553,450**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent to": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Norfolk (locality/agency)
PROJECT NAME: **Pope Avenue Shared Use Path**
LOCATION: Eastern terminus of Pope Avenue to Chesapeake Boulevard
DESCRIPTION: Construction of a 12' shared use path that connects the eastern terminus of Pope Avenue to Chesapeake Boulevard (approximately 230 feet). This project will complete a missing link for pedestrians from Pope Avenue to Chesapeake Boulevard providing a continuous path for users
DATE: 9.1.22 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $249,258

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* [9] project	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
BG 2 CT 31	0	0	0
BG 3 CT 31	0	0	0
BG 1 CT 32	0	0	0
BG 2 CT 32	0	0	0
BG 3 CT 32	0	23	23
BG 2 CT 33	0	0	0
total	0	23	23

Alternative mode commuters "without" proposed improvement (above) 23
Increase due to proposed improvement [3] **60%**
New alternative mode commuters (product) 14

Factor for roundtrips 2
Auto trip reduction [4] (product) 28 per day

Average length of auto trip replaced (one-way) 5 mi.[7]
VMT reduction (product) 138 mi./day

3- EMISSIONS CALCULATION Emissions year [5] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	28	0.325933	9	138	0.008267	1	10
NOx	28	0.255832	7	138	0.048618	7	14

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	10	0.001	250	30	0.001102	0.084	**$2,975,186**
NOx	14	0.001	250	30	0.001102	0.114	**$2,190,103**

Notes:
[1] Standard for civil projects.
[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx
[3] Source: TPS (see "alt commute % increase" tab in this workbook)
[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.
[5] From application
[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year
[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)
[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).
[9] "adjacent to": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

PEDESTRIAN IMPROVEMENTS

APPLICANT: Norfolk (locality/agency)

PROJECT NAME: **Virginia Beach Blvd at Ring Road Pedestrian Improvements**

LOCATION: Virginia Beach Boulevard at Ring Road Intersection

DESCRIPTION: Pedestrian signals, crosswalks, and ADA compliant ramps at the high-volume intersection. Modification of the western median will be needed to accommodate the straightened crosswalk.

DATE: 9/1/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $331,004

2- VMT REDUCTION ESTIMATE

ID, adjacent [9] blockgroups	Existing walk commuters [2]
CT 69.01, BG 1	23
CT 69.01, BG 2	8
CT 69.01, BG 3	34
total	65

Walk commuters "without" pedestrian improvement (above)	65
Increase due to pedestrian improvement [3]	**40%**
New active transportation commuters (product)	26
Factor for roundtrips	2
Auto trip reduction [4] (product)	52 per day
Average length of auto trip replaced (one-way)	5 mi.[7]
VMT reduction (product)	260 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	52	0.325933	16.9	260	0.008267	2.1	19.1
NOx	52	0.255832	13.3	260	0.048618	12.6	25.9

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	19.1	0.001	250	30	0.001102	0.158	**$2,097,027**
NOx	25.9	0.001	250	30	0.001102	0.214	**$1,543,670**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: CMAQ scoring tech update- post-6-17-22 TPS work area.pptx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

SIGNAL RETIMING

DATE: 9/1/2022 (application date)
APPLICANT: Norfolk (e.g. locality)
PROJECT NAME: **Citywide Signal Retiming Phase V**
LOCATION: Various
DESCRIPTION: Phase V of the Citywide Signal Retiming project consists of retiming 96 intersections within three systems throughout the City of Norfolk

Key: cell with formula (method of calculation)

1 - COST: $680,000

2 - EMISSIONS REDUCTION

		Low Volume Intersections	Medium Volume Intersections	High Volume Intersections	Total # of Intersections	
	pm peak hr range:	Less than 3,000 vph	3,000 to 6,000 vph	More than 6,000 vph		
Number of Intersections:		61	30	5	96	
multiplied by	pm peak hour volume:	2,000	4,500	10,000	vph [1]	
multiplied by	delay savings:	14	14	14	sec/veh [2]	
divided by	conversion factor:	3,600	3,600	3,600	sec/hr	
divided by	delay K factor:	0.17	0.17	0.17	delay K factor [3]	
multiplied by	weekday equivalents:	300	300	300	days/year (say)	
multiplied by	useful life:	5	5	5	years [5]	
Change in Vehicle Delay:		4,186,275	4,632,353	1,715,686	hours	

Total Change in Vehicle Delay (sum of the columns above): 10,534,314 hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr [4]	Heavy Duty (HD), % [6]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Light Duty, % (1-HD%)	Emissions Factor, Light Duty Vehs, g/hr [4]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	10,534,314	2.042	3.2%	688	97%	0.038072	388	1,077
NOx	10,534,314	16.204	3.2%	5,462	97%	0.079186	807	6,270

3 - COST EFFECTIVENESS

Type	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton	Cost Effectiveness, $/ton (product)
VOC	$680,000	1,077	$632	907	**$572,865**
NOx	$680,000	6,270	$108	907	**$98,371**

Notes:

[1] Based on range

[2] Pre-project delay 55 seconds * 25% full delay savings = 14 seconds.
(55 seconds: average control delay for LOS D/E, HCM 2000, Table 5)
(25% savings: avg. of 6 studies in *The benefits of retiming traffic signals* [Srinivasa Sunkari, ITE journal, Apr. 2004, p. 26]; article documented 7 studies, but one study's results were outlying)

[3] Portion of daily delay represented by peak hour; assumed not to change significantly over the decades.
Assume pm peak hour is the peak hour of the day.
Source: "Cost Benefit Model for Intersection Level of Service Improvements" (HRPDC, June 1997), pg. 8.

[4] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108) "IntImproveData" sheet filtered:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: 5 (urban street)

[5] Based on recommendation of retiming signals every three to five years (*Traffic Signal Timing Manual*, FHWA, June 2008, section 7.1.2), assume useful life of 5 years.

[6] Trucks, Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

PEDESTRIAN IMPROVEMENTS

APPLICANT: Suffolk (locality/agency)

PROJECT NAME: **Suburban Drive Sidewalk**

LOCATION: 250 feet from the intersection with Suburban Drive along Portsmouth Boulevard

Provide a connection from the existing Portsmouth Blvd Sidewalk that terminates at the intersection with Suburban Drive. This will also provide connectivity between phases one and two of the Suffolk Seaboard

DESCRIPTION: Coastline Trail

DATE: 8/15/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $850,000

2- VMT REDUCTION ESTIMATE

ID, adjacent [9] blockgroups	Existing walk commuters [2]
CT 755.04, BG 1	0
total	0

Walk commuters "without" pedestrian improvement (above) 0

Increase due to pedestrian improvement [3] 40%

New active transportation commuters (product) 0

Factor for roundtrips 2

Auto trip reduction [4] (product) 0 per day

Average length of auto trip replaced (one-way) 5 mi.[7]

VMT reduction (product) 0 mi./day

3- EMISSIONS CALCULATION Emissions year [8] 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	0	0.325933	0.0	0	0.008267	0.0	0.0
NOx	0	0.255832	0.0	0	0.048618	0.0	0.0

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	0.0	0.001	250	30	0.001102	0.000	**#DIV/0!**
NOx	0.0	0.001	250	30	0.001102	0.000	**#DIV/0!**

Notes:

[1] Standard for civil projects.

[2] Table: B08301 File: CMAQ scoring tech update- post-6-17-22 TPS work area.pptx

[3] Source: TPS (see "alt commute % increase" tab in this workbook)

[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.

[5] From application

[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab

[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)

[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).

[9] "adjacent": ie beside (not at the end of)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY

MULTI-USE PATH

APPLICANT: Suffolk (locality/agency)
PROJECT NAME: **Suffolk Seaboard Coastline Trail West**
LOCATION: From the end of the Prentis Street to Kenyon Road
DESCRIPTION: The Seaboard Coastline Trail is a multi-modal trail planned along the abandoned Seaboard Coastline rail corridor - This project will extend the existing trail an additional 3.3 miles
DATE: 8/15/2022 (application date)

Key: cell w/formula (method of calculation is shown in parentheses)

1- PROJECT DATA [5] Cost: $3,450,000

2- VMT REDUCTION ESTIMATE

Blockgroups *adjacent to* [9] project	Existing bicycle commuters [2]	Existing walk commuters [2]	Total existing alternative mode commuters (sum)
CT 652 BG 2	0	2	2
CT 653.01 BG 2	0	0	0
CT 754.01 BG 1	0	0	0
CT 754.04 BG 1	0	0	0
CT 754.05 BG 1	0	0	0
CT 757.01 BG 1	0	0	0
CT 757.02 BG 2	0	0	0
total	0	2	2

Alternative mode commuters "without" proposed improvement (above): 2
Increase due to proposed improvement [3]: **60%**
New alternative mode commuters (product): 1

Factor for roundtrips: 2
Auto trip reduction [4] (product): 2 per day

Average length of auto trip replaced (one-way): 5 mi. [7]
VMT reduction (product): 12 mi./day

3- EMISSIONS CALCULATION Emissions year [8]: 2030

	Auto Starts			Auto Running			Total
Type	Auto Starts Reduction, /day (above)	Emissions Factor, g/start [6]	Emissions Reduction-Starts, g/day (product)	VMT Reduction, mi/day (above)	Emissions Factor, g/mi [6]	Emissions Reduction-Running, g/day (product)	Emissions Reduction-Running, g/day (sum)
VOC	2	0.325933	1	12	0.008267	0	1
NOx	2	0.255832	1	12	0.048618	1	1

4- COST PER TON Analysis years: 30 [1]

Type	Emissions Reduction-Running, g/day (above)	Conversion Factor, kg/g	Workdays per year (say)	Analysis Years (above)	Conversion Factor, ton/kg	Emissions Reduction (ER), ton (product)	Cost per Ton ($ [above] / ER [left])
VOC	1	0.001	250	30	0.001102	0.007	**$473,567,517**
NOx	1	0.001	250	30	0.001102	0.010	**$348,603,980**

Notes:
[1] Standard for civil projects.
[2] Table: B08301 File: ACSDT5Y2015.B08301_data_with_overlays_2022-07-13T153102.xlsx
[3] Source: TPS (see "alt commute % increase" tab in this workbook)
[4] Assume that these simplifications offset each other: a) only examining commuting (e.g. ignoring shopping), and b) using a one-to-one relationship between new alt mode trips and eliminated auto trips.
[5] From application
[6] Source: NCHRP project 2525 task 108 toolkit (Excel) "BikePedData" tab, for given emissions year
[7] Source: 6-17-22 TPS meeting (note: avg. alt mode trips are shorter than 5 mi; avg. auto trips are longer than 5 mi)
[8] Approximate project implementation year. Given the difficulty of forecasting vehicle regulations and mix, use implementation-year emissions factors throughout the useful life of the project (as recommended by 2019 NCHRP CMAQ emission reduction toolkit).
[9] "adjacent to": ie beside (not at the end of)

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CONGESTION MITIGATION AND AIR QUALITY

SIGNAL RETIMING

DATE: 8/31/2022 (application date)
APPLICANT: Suffolk (e.g. locality)
PROJECT NAME: **Citywide Traffic Signal System Timing**
LOCATION: Various
DESCRIPTION: Development and implementation of signal timing plans for coordinated traffic signal systems throughout the City of Suffolk.

Key: cell with formula (method of calculation)

1 - COST: $910,000

2 - EMISSIONS REDUCTION

		Low Volume Intersections	Medium Volume Intersections	High Volume Intersections	Total # of Intersections	
	pm peak hr range:	Less than 3,000 vph	3,000 to 6,000 vph	More than 6,000 vph		
Number of Intersections:		95	15	1	111	
multiplied by	pm peak hour volume:	2,000	4,500	10,000	vph [1]	
multiplied by	delay savings:	14	14	14	sec/veh [2]	
divided by	conversion factor:	3,600	3,600	3,600	sec/hr	
divided by	delay K factor:	0.17	0.17	0.17	delay K factor [3]	
multiplied by	weekday equivalents:	300	300	300	days/year (say)	
multiplied by	useful life:	5	5	5	years [5]	
Change in Vehicle Delay:		6,519,608	2,316,176	343,137	hours	

Total Change in Vehicle Delay (sum of the columns above): 9,178,922 hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr [4]	Heavy Duty (HD), % [6]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Light Duty, % (1-HD%)	Emissions Factor, Light Duty Vehs, g/hr [4]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	9,178,922	2.042	3.2%	600	97%	0.038072	338	938
NOx	9,178,922	16.204	3.2%	4,759	97%	0.079186	704	5,463

3 - COST EFFECTIVENESS

Type	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton	Cost Effectiveness, $/ton (product)
VOC	$910,000	938	$970	907	**$879,832**
NOx	$910,000	5,463	$167	907	**$151,083**

Notes:

[1] Based on range

[2] Pre-project delay 55 seconds * 25% full delay savings = 14 seconds.
(55 seconds: average control delay for LOS D/E, HCM 2000, Table 5)
(25% savings: avg. of 6 studies in *The benefits of retiming traffic signals* [Srinivasa Sunkari, ITE journal, Apr. 2004, p. 26]; article documented 7 studies, but one study's results were outlying)

[3] Portion of daily delay represented by peak hour; assumed not to change significantly over the decades.
Assume pm peak hour is the peak hour of the day.
Source: "Cost Benefit Model for Intersection Level of Service Improvements" (HRPDC, June 1997), pg. 8.

[4] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108) "IntImproveData" sheet filtered:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: 5 (urban street)

[5] Based on recommendation of retiming signals every three to five years (*Traffic Signal Timing Manual* , FHWA, June 2008, section 7.1.2), assume useful life of 5 years.

[6] Trucks, Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

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CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Suffolk (e.g. locality)
PROJECT NAME: **S. Quay Road at O'Kelly Drive turn lane**
LOCATION: Intersection of S. Quay Road and O'Kelly Drive
DATE: 8/8/2022 (application date)
DESCRIPTION: Provide for a right turn lane from eastbound S. Quay Road onto southbound O'Kelly Drive

Key: cell with formula (method of calculation)

1 - COST $1,550,000 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour		
Intersection Delay Before Project	6.9	sec/veh [1]
Intersection Delay After Project	6.6	sec/veh [1]
Reduction in Intersection Delay (diff.)	0.30	sec/veh, pk hr
multiplied by	6,024	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	26,576	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	26,576	2.042	3.2%	2	96.8%	0.03807	1	3
NOx	26,576	16.204	3.2%	14	96.8%	0.07919	2	16

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$1,550,000	3	$570,659	907	**$517,588,086**
NOx	$1,550,000	16	$97,992	907	**$88,879,100**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

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CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Suffolk (e.g. locality)
PROJECT NAME: **Portsmouth Blvd/Suburban Drive Intersection Improvements**
LOCATION: Intersection of Portsmouth Blvd and Suburban Dr
DATE: 8/31/2022 (application date)
DESCRIPTION: Upgrading existing signal equipment and adding needed turn lane and pedestrian improvements

Key: cell with formula (method of calculation)

1 - COST $2,290,000 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour

Intersection Delay Before Project	21.4	sec/veh [1]
Intersection Delay After Project	20	sec/veh [1]
Reduction in Intersection Delay (diff.)	1.40	sec/veh, pk hr
multiplied by	1,837	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	37,821	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	37,821	2.042	3.2%	2	96.8%	0.03807	1	4
NOx	37,821	16.204	3.2%	20	96.8%	0.07919	3	23

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$2,290,000	4	$592,447	907	**$537,349,787**
NOx	$2,290,000	23	$101,734	907	**$92,272,536**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

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CONGESTION MITIGATION AND AIR QUALITY
ISOLATED INTERSECTON IMPROVEMENT

APPLICANT: Suffolk (e.g. locality)
PROJECT NAME: **Route 460 Corridor Improvements - Part 1**
LOCATION: Intersection of Route 460 and Kings Fork
DATE: 8/17/2022 (application date)
DESCRIPTION: Adding right turn lanes at Lake Prince and Kings Fork Road and modification to existing turn lanes to provide additional vehicle storage

Key: cell with formula (method of calculation)

1 - COST $3,250,000 [1]

2 - EMISSIONS REDUCTION

Weekday Peak Hour

Intersection Delay Before Project	23.5	sec/veh [1]
Intersection Delay After Project	22.3	sec/veh [1]
Reduction in Intersection Delay (diff.)	1.20	sec/veh, pk hr
multiplied by	2,583	veh/pkhr [1]
divided by	3,600	sec/hr
divided by	17%	pk hr delay factor [2]
multiplied by	300	wkday equivalents / year (say)
multiplied by	30	useful life, years [4]
Reduction in Intersection Delay	45,582	hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[3]	Trucks, % [5]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Autos, % (1-truck%)	Emissions Factor, Light Duty Vehs, g/hr[3]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	45,582	2.042	3.2%	3	96.8%	0.03807	2	5
NOx	45,582	16.204	3.2%	24	96.8%	0.07919	3	27

3 - COST EFFECTIVENESS

Type of Emissions	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effective-ness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effective-ness, $/ton (product)
VOC	$3,250,000	5	$697,637	907	**$632,756,331**
NOx	$3,250,000	27	$119,797	907	**$108,655,540**

Notes:
[1] From application
[2] pk hr delay factor = pk hr delay / daily delay; assumed not to change signficantly over the decades
Source: "Cost Benefit Model for Intersection Level of Service Improvements", HRPDC, Page 8, June 1997.
[3] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108)- assumptions:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: urban (5)
[4] standard for civil projects
[5] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

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CONGESTION MITIGATION AND AIR QUALITY

CORRIDOR SIGNAL NEW COORDINATION [3]

APPLICANT: Suffolk (e.g. locality)
PROJECT NAME: Rt 58 ITS Sensors
LOCATION: Pioneer Road to the Southampton County Line
DATE: 8/15/2022
DESCRIPTION: Upgrade signal control equipment and coordinate signals along Bridge Road (10 signals)

Key: cell with formula (method of calculation)

1 - COST, TRUCKS %

Project Cost $3,200,000 Truck % 22.2% for corridor; if no # supplied, use regional average [6]

2 - EMISSIONS REDUCTION

Holland Rd	Coordination Segment Length, mi [1]	AADT (avg. day, not wkday) [1]	Pre-Coord Travel Time, hr/day [2]	Travel Time Reduction due to Coordination, % [3]	Travel Time Reduction, hr/day (product)	Useful Life, yrs [4]	Days per year	Travel Time Reduction over Useful Life, hr (product)
Pioneer/Ct Line	9.3	22,520	10,472	5%	524	10	365	1,911,104
			0		0	10	365	0
			0		0	10	365	0
total	9.3						total	1,911,104

Type of Emissions	Travel Time Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr [5]	Heavy Duty, % (above)	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Light Duty, % (1-HD%)	Emissions Factor, Light Duty Vehs, g/hr [5]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	1,911,104	4.757	22.2%	2,018	77.8%	0.210	312	2,330
NOx	1,911,104	60.270	22.2%	25,570	77.8%	0.980	1,457	27,028

3 - COST EFFECTIVENESS

Type	Cost (above)	Emissions Reduction, kg (above)	kg/ton	Emissions Reduction, tons (quotient)	Cost Effective-ness, $/ton (quotient)
VOC	$3,200,000	2,330	907	2.6	**$1,245,575**
NOx	$3,200,000	27,028	907	29.8	**$107,386**

Notes:

[1] From application

[2] Based on time-cost of travel for VB Blvd, Hampton Blvd, and Victoria Blvd (3 min/mile)

[3] Based on before/after travel times for six projects in Escondido CA, FY13-FY18 (3%-34%), most of which were re-coordinations, the re-coordination sheet uses 15%; for new coordinations (this sheet), use a number higher than 15%.

[4] TPS, 2-18-22 meeting

[5] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108) "SignalSyncData" sheet filtered with: year 2030 (estimated project year factor used throughout useful life) speed 20 mph (average speed; inverse of above time-cost) road type: 5 (urban street)

[6] Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

Hampton Roads TPO 6/7/2023

CONGESTION MITIGATION AND AIR QUALITY
NEW OR EXPANDED BUS SERVICE

APPLICANT: Suffolk Transit
PROJECT NAME: **Upper York County/New Kent Connector - Demonstration Route**
LOCATION: Suffolk
DESCRIPTION: Install digital bus stop signage displaying real-time passenger information.
DATE: 8/21/2022 (application date)

Key: cell w/ formula (method of calculation is shown in parentheses)

1 - BUS PROJECT DATA: [1]

cost	boardings/day	VMT/day	days/year [2]	analysis years [6]
$1,000,000	600	490	250	3

2 - INCREASED BUS EMISSIONS:

Type	Emissions, g/mi [3]	VMT/day (above)	Bus Days / yr (above)	Analysis Years (above)	kg/g	Emissions Increase, kg (product)
VOC	0.149701	490	250	3	0.001	55
NOx	1.749704	490	250	3	0.001	643

3 - REDUCED AUTO EMISSIONS:

Bus ridership estimate:	600	above
Portion of bus trips that would have been made in auto:	53% [4]	
Reduction in Auto Trips:	318	trips
Average auto trip length:	10	miles/trip [5]
Reduction in Auto VMT:	3,180	miles/day

Auto Starts

Type	Emissions Factor, g/start [3]	kg/g	Starts Reduction, per day (above)	Analysis days per year (above)	Analysis Years (above)	Emissions Reduction, kg (product)
VOC	0.325933	0.001	318	250	3	78
NOx	0.255832	0.001	318	250	3	61

Auto Running

Type	Emissions Factor, g/mi [3]	kg/g	VMT Reduction, mi/day (above)	Analysis days per year (above)	Analysis Years (above)	Emissions Reduction, kg (product)
VOC	0.008267	0.001	3,180	250	3	20
NOx	0.048618	0.001	3,180	250	3	116

4 - EMISSIONS CHANGE (+/-):

Type	Bus Emissions, kg (above)	Auto Starts Emissions, kg (above)	Auto Running Emissions, kg (above)	Total Change in Emissions, kg (sum)
VOC	55	-78	-20	-42
NOx	643	-61	-116	466

5 - COST EFFECTIVENESS:

Type	Cost (above)	Total Change in Emissions, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton	Cost Effectiveness, $/ton (product)
VOC	$1,000,000	-42	$23,564	907	**$21,372,662**
NOx	$1,000,000	466	n.a.	907	**n.a.**

[1] From application
[2] Days per year that the subject service runs, e.g. weekday service: 5*52 = 260 days
[3] NCHRP project 2525 task 108 toolkit (Excel)
Bus emissions factors:
1) if funding will be used only for additional operation of *existing bus fleet*, use column F on "NewBusServiceCalcs" tab as follows:
inputs set on "New Bus Services" tab: Project Year: 2030; Before VMT: 0; After VMT: 1
2) if funding will be used--in part or whole--for *new buses*, use column I of "NewTransitBusData" tab as follows:
filters: yearID 2030, modelyearid 2030, fueltypeid (gas: 1; diesel: 2; CNG: 3; EV: 9), roadtypeid 5 (urban unrestricted access)
Auto emissions factors:
Enter on "New Bus Services" tab Project Year: 2030; Car Trips: 1; Trip Distance: 1. Get EFs from col. D on "NewBusServiceCalcs" tab.
[4] 53%, from GRTC 2019 on-board survey ("how would you have made this trip?") - sum of new auto trips
("driven alone", "gotten someone to drive me", and "used a taxi, Uber, or Lyft"), factored up to include a portion of "not sure"
[5] Average trip length for personal vehicle trips, 2001 NHTS
[6] CMAQ operations funding is available for three years

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CONGESTION MITIGATION AND AIR QUALITY

SIGNAL RETIMING

DATE:	8/21/2022	(application date)
APPLICANT:	Suffolk	(e.g. locality)
PROJECT NAME:	**Suffolk Transit bus pre-emption**	
LOCATION:	Various	
DESCRIPTION:	Allow buses to interact with the City's traffic signals for signal pre-emption	

Key: cell with formula (method of calculation)

1 - COST: $37,800

2 - EMISSIONS REDUCTION

		Low Volume Intersections	Medium Volume Intersections	High Volume Intersections	Total # of Intersections	
	pm peak hr range:	Less than 3,000 vph	3,000 to 6,000 vph	More than 6,000 vph		
Number of Intersections:		4	2	0	6	
multiplied by	pm peak hour volume:	2,000	4,500	10,000	vph [1]	
multiplied by	delay savings:	14	14	14	sec/veh [2]	
divided by	conversion factor:	3,600	3,600	3,600	sec/hr	
divided by	delay K factor:	0.17	0.17	0.17	delay K factor [3]	
multiplied by	weekday equivalents:	300	300	300	days/year (say)	
multiplied by	useful life:	5	5	5	years [5]	
Change in Vehicle Delay:		274,510	308,824	0	hours	

Total Change in Vehicle Delay (sum of the columns above): 583,333 hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[4]	Heavy Duty (HD), % [6]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Light Duty, % (1-HD%)	Emissions Factor, Light Duty Vehs, g/hr[4]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	583,333	2.042	3.2%	38	97%	0.038072	21	60
NOx	583,333	16.204	3.2%	302	97%	0.079186	45	347

3 - COST EFFECTIVENESS

Type	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton	Cost Effectiveness, $/ton (product)
VOC	$37,800	60	$634	907	**$575,076**
NOx	$37,800	347	$109	907	**$98,751**

Notes:

[1] Based on range

[2] Pre-project delay 55 seconds * 25% full delay savings = 14 seconds.
(55 seconds: average control delay for LOS D/E, HCM 2000, Table 5)
(25% savings: avg. of 6 studies in *The benefits of retiming traffic signals* [Srinivasa Sunkari, ITE journal, Apr. 2004, p. 26];
article documented 7 studies, but one study's results were outlying)

[3] Portion of daily delay represented by peak hour; assumed not to change significantly over the decades.
Assume pm peak hour is the peak hour of the day.
Source: "Cost Benefit Model for Intersection Level of Service Improvements" (HRPDC, June 1997), pg. 8.

[4] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108) "IntImproveData" sheet filtered:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: 5 (urban street)

[5] Based on recommendation of retiming signals every three to five years (*Traffic Signal Timing Manual* , FHWA, June 2008, section 7.1.2), assume useful life of 5 years.

[6] Trucks, Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

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CONGESTION MITIGATION AND AIR QUALITY
BUS[4] REPLACEMENT

APPLICANT: Suffolk (locality/agency)
PROJECT NAME: **Low or No Emission Replacement Bus and Charging Infrastructure**
DESCRIPTION: 9 new electric buses
DATE: 7/10/2020 (application date)

Key: cell with formula (method of calculation)

	Existing Buses	Proposed Buses	
Model Year [1]	2023	2029	
Fuel Type [1]	gas	electric	
Number of Buses (# to be purchased = # to be retired)		9	buses[1]
Annual Vehicle-Miles per bus (old&new buses)		44,434	VMT/year[1]
Expected Years of Service per new bus		15	years[3]

1 - COST $6,933,075 [1]

2 - EMISSIONS REDUCTION

Type	Emissions Factor for Existing Buses, g/mi [2]	Emissions Factor for Proposed Buses, g/mi [2]	Emissions Factor Reduction, g/mi (difference)	Buses (above)	Annual VMT per bus (above)	Expected Years of Service per new bus (above)	Emissions Reduction, kg (product/ 1,000)
VOC	0.90215	0.00000	0.90215	9	44,434	15	5,412
NOx	0.55112	0.00000	0.55112	9	44,434	15	3,306

3 - COST EFFECTIVENESS

Type	Cost (above)	Emissions Reduction, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effectiveness, $/ton (product)
VOC	$6,933,075	5,412	$1,281.14	907	**$1,161,992**
NOx	$6,933,075	3,306	$2,097.14	907	**$1,902,108**

[1] From application
[2] NCHRP project 2525 task 108 toolkit (Excel, "NewTransitBusData" tab), based on these inputs:
model year (modelyearid) and fuel type (fueltypeid: gas[1], diesel[2], CNG[3], EV[9]) based on application;
analysis year (yearID=2030); road type (roadtypeid=5 [urban unrestricted access])
[The emissions factors on the prototype sheet (6.08, 0.655, 12.11, 0.93) came from the old (2020) calculation sheet.]
[3] Average retirement age of a 12-year bus is 15.1 years (Laver, et al. Useful Life of Transit Buses and Vans. FTA, 2007)

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CONGESTION MITIGATION AND AIR QUALITY

SIGNAL RETIMING

DATE: 8/29/2022 (application date)
APPLICANT: Virginia Beach (e.g. locality)
PROJECT NAME: **Corridor Traffic Signal Retiming**
LOCATION: Various
DESCRIPTION: 96 intersections within four systems throughout the City of Virginia Beach

Key: cell with formula (method of calculation)

1 - COST: $960,000

2 - EMISSIONS REDUCTION

		Low Volume Intersections	Medium Volume Intersections	High Volume Intersections	Total # of Intersections	
	pm peak hr range:	Less than 3,000 vph	3,000 to 6,000 vph	More than 6,000 vph		
Number of Intersections:		38	48	10	96	
multiplied by	pm peak hour volume:	2,000	4,500	10,000	vph [1]	
multiplied by	delay savings:	14	14	14	sec/veh [2]	
divided by	conversion factor:	3,600	3,600	3,600	sec/hr	
divided by	delay K factor:	0.17	0.17	0.17	delay K factor [3]	
multiplied by	weekday equivalents:	300	300	300	days/year (say)	
multiplied by	useful life:	5	5	5	years [5]	
Change in Vehicle Delay:		2,607,843	7,411,765	3,431,373	hours	

Total Change in Vehicle Delay (sum of the columns above): 13,450,980 hours

Type of Emissions	Delay Reduction, hr (above)	Emissions Factor, Heavy Duty Vehs, g/hr[4]	Heavy Duty (HD), % [6]	Emissions Reduction, Heavy Duty Vehs, kg (product/ 1,000)	Light Duty, % (1-HD%)	Emissions Factor, Light Duty Vehs, g/hr[4]	Emissions Reduction, Light Duty Vehs, kg (product/ 1,000)	Emissions Reduction, All Vehs, kg (sum)
VOC	13,450,980	2.042	3.2%	879	97%	0.038072	496	1,375
NOx	13,450,980	16.204	3.2%	6,975	97%	0.079186	1,031	8,006

3 - COST EFFECTIVENESS

Type	Cost, $ (above)	Emissions Reduction, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton	Cost Effectiveness, $/ton (product)
VOC	$960,000	1,375	$698	907	**$633,384**
NOx	$960,000	8,006	$120	907	**$108,763**

Notes:

[1] Based on range

[2] Pre-project delay 55 seconds * 25% full delay savings = 14 seconds.
(55 seconds: average control delay for LOS D/E, HCM 2000, Table 5)
(25% savings: avg. of 6 studies in *The benefits of retiming traffic signals* [Srinivasa Sunkari, ITE journal, Apr. 2004, p. 26];
article documented 7 studies, but one study's results were outlying)

[3] Portion of daily delay represented by peak hour; assumed not to change significantly over the decades.
Assume pm peak hour is the peak hour of the day.
Source: "Cost Benefit Model for Intersection Level of Service Improvements" (HRPDC, June 1997), pg. 8.

[4] CMAQ Emission Reduction Toolkit (NCHRP, 25-25, Task 108) "IntImproveData" sheet filtered:
year 2030 (estimated project year factor used throughout useful life)
speed 0 mph (idling)
road type: 5 (urban street)

[5] Based on recommendation of retiming signals every three to five years (*Traffic Signal Timing Manual* , FHWA, June 2008, section 7.1.2), assume useful life of 5 years.

[6] Trucks, Non-freeways in Hampton Roads, CMP 2017-2019 network (3.2%)

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CONGESTION MITIGATION AND AIR QUALITY
BUS[4] REPLACEMENT

APPLICANT: WATA (locality/agency)
PROJECT NAME: **Five (5) Bus Purchase Replacement**
DESCRIPTION: 5 new electric buses
DATE: 7/18/2022 (application date)

Key: cell with formula (method of calculation)

	Existing Buses	Proposed Buses	
Model Year [1]	2017	2029	
Fuel Type [1]	diesel	electric	
Number of Buses (# to be purchased = # to be retired)		5	buses[1]
Annual Vehicle-Miles per bus (old&new buses)		75,000	VMT/year[1]
Expected Years of Service per new bus		15	years[3]

1 - COST $6,158,089 [1]

2 - EMISSIONS REDUCTION

Type	Emissions Factor for Existing Buses, g/mi [2]	Emissions Factor for Proposed Buses, g/mi [2]	Emissions Factor Reduction, g/mi (difference)	Buses (above)	Annual VMT per bus (above)	Expected Years of Service per new bus (above)	Emissions Reduction, kg (product/ 1,000)
VOC	0.091080508	0.00000	0.09108	5	75,000	15	512
NOx	1.44851	0.00000	1.44851	5	75,000	15	8,148

3 - COST EFFECTIVENESS

Type	Cost (above)	Emissions Reduction, kg (above)	Cost Effectiveness, $/kg (quotient)	Conversion Factor, kg/ton (fixed)	Cost Effectiveness, $/ton (product)
VOC	$6,158,089	512	$12,019.82	907	**$10,901,977**
NOx	$6,158,089	8,148	$755.79	907	**$685,505**

[1] From application
[2] NCHRP project 2525 task 108 toolkit (Excel, "NewTransitBusData" tab), based on these inputs:
model year (modelyearid) and fuel type (fueltypeid: gas[1], diesel[2], CNG[3], EV[9]) based on application;
analysis year (yearID=2030); road type (roadtypeid=5 [urban unrestricted access])
[The emissions factors on the prototype sheet (6.08, 0.655, 12.11, 0.93) came from the old (2020) calculation sheet.]
[3] Average retirement age of a 12-year bus is 15.1 years (Laver, et al. Useful Life of Transit Buses and Vans. FTA, 2007)

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