

June 2, 2022

MEMORANDUM

TO: Members, Transportation Technical Committee
 FROM: Cristina Finch, AICP, LEED AP, Secretary to the Transportation Technical Committee
 SUBJ: June 9, 2022 TTC Meeting/Agenda

The June meeting of the Transportation Technical Committee (TTC) will be held Thursday, June 9, 2022 at 1:30 p.m. at the Roanoke Valley-Alleghany Regional Commission office (Top Floor Conference Room), 313 Luck Avenue, SW, Roanoke, VA.

TTC AGENDA

1. Welcome, Call to Order *Chair Jamison*
2. Roll Call (including consideration of remote participation) *Chair Jamison*
3. **Action Requested:** Approval of the Consent Agenda items: *Chair Jamison*
 - A. Approval of the Agenda
 - B. Action on the May 12, 2022 TTC Minutes, pp. 2 – 12
4. Chair’s Remarks *Chair Jamison*
5. Nominating Committee Report/Election of Officers, p. 13 *Wayne Leftwich & Mariel Fowler*
6. Continued Development of the Roanoke Valley *Cristina Finch & David Jackson,*
 Transportation Plan, pp. 14 – 51 *Cambridge Systematic*
7. Other Business
 - A. Discussion on Federal Grant Opportunities*Jonathan Stanton*
8. Comments by TTC Members and/or Citizens
9. Adjournment (by 2:30 p.m.)

TPO POLICY BOARD: Cities of Roanoke and Salem; Counties of Bedford, Botetourt, Montgomery and Roanoke; Town of Vinton; Greater Roanoke Transit Company (*Valley Metro*); Roanoke-Blacksburg Regional Airport; Virginia Department of Rail & Public Transportation; Virginia Department of Transportation

MINUTES

The May meeting of the Transportation Technical Committee was held on Thursday, May 12, 2022, at 1:30 p.m. at the Roanoke Valley-Alleghany Regional Commission, 313 Luck Avenue, SW, Roanoke, VA.

1. WELCOME, CALL TO ORDER

Chair Jamison called the meeting to order at 1:30 p.m.

2. ROLL CALL (including consideration of remote participation)

Ms. Cristina Finch, Secretary to the TTC, called the roll and confirmed that a quorum was present.

VOTING MEMBERS PRESENT

Mariel Fowler	County of Bedford
David Givens	County of Botetourt
Jonathan McCoy	County of Botetourt
Megan Cronise	County of Roanoke
Will Crawford	County of Roanoke
Wayne Leftwich	City of Roanoke
Mark Jamison, <i>Chair</i>	City of Roanoke
Crystal Williams	City of Salem
Anita McMillan (<i>via Zoom</i>)	Town of Vinton
Cody Sexton, <i>Vice Chair</i>	Town of Vinton
William Long	Greater Roanoke Transit Company
Frank Maguire	Roanoke Valley Greenway Commission
Michael Gray	Virginia Dept. of Transportation - Salem District
Daniel Wagner (<i>via Zoom</i>)	Virginia Dept. of Rail and Public Transportation

VOTING MEMBERS ABSENT

Dan Brugh	County of Montgomery
Nathan Sanford	Unified Human Serv. Transp. System (RADAR)

NON-VOTING MEMBERS ABSENT

Kevin Jones	Federal Highway Administration
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RVARC Staff Present: Cristina Finch, Bryan Hill, Andrea Garland, Alison Stinnette, Jonathan Stanton, and Virginia Mullen.

TPO POLICY BOARD: Cities of Roanoke and Salem; Counties of Bedford, Botetourt, Montgomery and Roanoke; Town of Vinton; Greater Roanoke Transit Company (*Valley Metro*); Roanoke-Blacksburg Regional Airport; Virginia Department of Rail & Public Transportation; Virginia Department of Transportation

Others Present: Sarah Windmiller (via Zoom), Cambridge Systematics.

Chair Jamison reported that Ms. Anita McMillan, representing the Town of Vinton, and Mr. Daniel Wagner, representing the Virginia Department of Rail and Public Transportation, have requested to participate remotely in today's meeting of the Roanoke Valley Transportation Technical Committee under the "RVTPO Written Policy for Electronic Meeting Participation", allowing for remote participation under special circumstances with a physical quorum present. Ms. McMillan's request is a personal matter—she will be out of town for her daughter's graduation. Mr. Wagner's remote participation request is for a period ending July 1, 2023 and is as of a result of his principal residence being 60 miles or more from the primary meeting location.

Unanimous Consent Request: by Chair Jamison to approve the remote participation requests by Ms. McMillan and Mr. Wagner.

Action by the Chair: without objection, the requests were approved.

3. **ACTION REQUESTED: APPROVAL OF CONSENT AGENDA ITEMS**

The following consent agenda items were distributed earlier:

- A. May 12, 2022 TTC Meeting Agenda
- B. April 14, 2022 TTC Minutes

Motion: by Wayne Leftwich to approve items (A) and (B), under the consent agenda, as presented; seconded by Crystal Williams.

TTC Action: Motion carried unanimously.

4. **CHAIR REMARKS**

- Chair Jamison announced that he will be retiring at the end of June 2022. Typically, Chair's term will conclude at the end of the July meeting but Chair Jamison will not be able to attend the meeting. Vice Chair Sexton will not be in attendance as well.

Motion: by Mark Jamison to suspend the rules in Article VI, Section 2 such that the election of officers be held at the June 9th regular meeting rather than July 14; seconded by Anita McMillan.

TTC Action: Motion carried unanimously.

Chair Jamison appointed Wayne Leftwich and Mariel Fowler to serve on the 2022 Nominating Committee.

5. **CONTINUED DEVELOPMENT OF THE ROANOKE VALLEY TRANSPORTATION PLAN**

Sarah Windmiller presented a summary update on the priority needs process and plan objectives and performance measures (the PowerPoint presentation is included with the Minutes). Ms. Windmiller reported that the RVTP team has developed an on-line, map-based

tool--NEST (Needs Evaluation and Solution Tool) --and demonstrated how it works. Cristina Finch discussed the individual member meetings that have started and will be held in May to confirm priority gap needs for the region to focus on over the next several years.

6. CONSIDERATION OF DRAFT AMENDMENT #2 TO THE FY 2021–2024 TRANSPORTATION IMPROVEMENT PROGRAM

Bryan Hill reported that following release of the Virginia Department of Rail and Public Transportation’s (DRPT) Draft FY23-28 Six-Year Improvement Program (SYIP) on April 20th, staff received a request from DRPT to amend the FY21-24 Transportation Improvement Program (TIP). The amendment request is to include Roanoke County’s new request for FTA 5310 capital assistance funding to operate its CORTRAN service for seniors and people with disabilities next year. This project is recommended for inclusion in the DRPT FY23-28 SYIP.

Mr. Hill explained that although not originally planned for FY23 in the RVTPO’s TIP, Roanoke County applied for \$613,338 in 5310 capital and operating funds for its CORTRAN service.

Applicant	Project	Funded Amount (Proposed)	Match
Roanoke County (CORTRAN)	CORTRAN service	\$288,000 (Large Urban)	\$230,400 (80% Federal) \$46,080 (16% State) \$11,520 (4% Local)
Roanoke County (CORTRAN)	Operating service for one year	\$250,000 (Rural)	\$200,000 (80% Federal) \$40,000 (16% State) \$10,000 (4% Local)

Mr. Hill noted that for this amendment, \$288,000 in Large Urban 5310 funding for CORTRAN transit vehicles is only being considered as it is a new project not originally in the TIP.

Ms. Megan Cronise commented that the way the project is described (a capital transit vehicle program) is a bit confusing since Roanoke County will operate a turnkey program through its transit provider Via. The program, among other operating activities, includes the leasing of transit vehicles (not purchase). Ms. Cronise believed the dollar amount to be correct, but the project description odd. Mr. Hill replied that the funding category listed on the DRPT portal, which included capital and operating, was confusing and made the assumption it was for vehicles. Mr. Hill added that he will be seeking clarification from DRPT.

Motion: by Frank Maguire to amend the report according to DRPT clarification and recommend to the RVTPO Policy Board approval of Amendment #2 to the FY 2021-2024 TIP-Roanoke County CORTRAN Service; seconded by Jonathan McCoy.

TTC Action: Motion carried unanimously.

7. CONSIDERATION OF ADDITIONAL ALLOCATION OF FY2023-2024 TRANSPORTATION ALTERNATIVES SET-ASIDE FUNDS

As outlined in the accompanying staff report, Mr. Bryan Hill briefed the Committee on the two locality requests received for the additional \$163,105 in FY23 and FY24 Transportation

Alternatives Set-Aside Block Grant funding. Those requests were: 1) Town of Vinton, Glade Creek Greenway Phase 2B - \$162,000; and 2) Roanoke County, Roanoke River Greenway, Parkway Crossing - \$87,642. Mr. Hill explained the rationale for each request and the additional cost estimate increases from those originally approved in the Roanoke Valley Transportation Plan.

Locality	Project	RVTP Project Cost Estimate	Updated Cost Estimate	Previous TPO TA Allocations	% Cost Increase	Additional Funding Request
Vinton	Glade Creek Greenway Phase 2B	\$476,000	\$784,659	\$380,800	65%	\$162,000
Roanoke County	Roanoke River Greenway, Parkway Crossing	\$708,258	\$795,900	\$200,000	12%	\$87,642
TOTAL REQUESTED						\$249,642

Additionally, Mr. Hill provided the Committee with a recommended funding scenario for its consideration:

Locality	Project	Staff Recommended Funding Scenario
Vinton	Glade Creek Greenway Phase 2B	\$75,463
Roanoke County	Roanoke River Greenway, Parkway Crossing	\$87,642
TOTAL		\$163,105

This scenario fully funds the Roanoke River Greenway project's cost overrun, instead of splitting the additional funds in half (\$81,552.50). Given the current progress of both requests, staff believes that the Roanoke River Greenway, Parkway Crossing project is closer to advertisement, hence the recommendation to fully fund the cost estimate overrun.

The revised estimated costs for both projects constitute a major change in the project cost, which therefore triggers an amendment to the RVTPO's Transportation Plan. The table below shows the current estimated project costs of the two subject projects and the left column refers to its history of past amendments in the Plan.

#	UPC	Jurisdiction	Project Title	Project Limits	Project Description	Est. Cost in Year of Expenditure
59 and A2-37	109611	Town of Vinton	Glade Creek Greenway, Phase 2B	Gearhart Park to Walnut Avenue	Paved 10' wide greenway from Gearhart Park to Walnut Avenue.	\$476,000
A1-7 and A2-23 and A4-10	113356	Roanoke County	Roanoke River Greenway – Blue Ridge Parkway Crossing along Highland Road	Blue Ridge Parkway and Highland Road	Construction of 0.30 miles of Roanoke River Greenway underneath the Blue Ridge Parkway, connecting bicyclists and pedestrians safely to other funded sections of the Roanoke River Greenway.	\$708,258

The proposed amendment to the current transportation plan would confirm the Board’s agreement with pursuit of these projects given the increase in estimated costs.

Cody Sexton commented that he noticed using the term “cost overrun” is perceived negatively and suggested using terms such as “budget amendment”, “cost adjustment” or similar.

Mr. Hill indicated that Vinton’s request of \$162,000 was reflective of the 80% required federal match, and that the town would provide the required local match of \$32,400.

Ms. Cronise noted that \$87,642 is what Roanoke County needs, and she is not sure if this amount needs to be adjusted to \$70,113 to include the 20% match. Mr. Gray replied that he was not certain how it should be listed in this case as some documents show the full amount, and others show the breakdown with the federal match. He will doublecheck.

Motion: by Frank Maguire to accept staff’s recommendation in the staff report, pending clarifying the funding total amount because of the 20% match. Staff recommendation was as follows:

1. Recommend to the RVTPO Policy Board amending the RVTPO’s Transportation Plan to reflect the updated project cost estimate for the projects noted above.
2. Recommend to the RVTPO Policy Board the additional allocation of Transportation Alternatives Set-Aside Block Grant Program funding.

The motion was seconded by Megan Cronise.

TTC Action: Roll call vote - Ayes 14 (Fowler, Givens, McCoy, Cronise, Crawford, Leftwich, Jamison, Williams, McMillan, Sexton, Long, Maguire, Wagner, Gray); Nays 0; and Abstentions 0. Motion carried unanimously.

Mr. Cody Sexton inquired if the math related to the federal and local matches would be reconciled before the RVTPO acts on this matter. Mr. Hill indicated affirmatively.

Editorial Note: *Following the May 12 meeting, staff confirmed with Roanoke County that the full amount requested for the Roanoke River Greenway, Parkway Crossing project should in fact be \$70,113 (representing the 80% federal match only). As a result, the Town of Vinton request for the Glade Creek Greenway Phase 2B would be increased by \$17,528 to \$92,991. This revised scenario will constitute the TTC and staff recommendation to the RVTPO Policy Board at their May 26 meeting.*

8. OTHER BUSINESS

Jonathan McCoy announced that Botetourt County is seeking input from the community to update their comprehensive plan. The link for Botetourt Survey is active until June 3, 2022: <https://www.botetourtva.gov/comprehensiveplan>.

Michael Gray announced the Six-Year Improvement Plan Public Meeting is today at 4 p.m. at the Holiday Inn (3315 Ordway Drive Northwest, Roanoke VA 24017).

Anita McMillan announced the Town of Vinton will solicit bids for the Walnut Avenue Phase 1 project soon.

Megan Cronise announced that Roanoke County is hosting a second community meeting for the Route 460 Land Use and Connectivity Study on May 18, 2022, from 4 p.m. to 6 p.m. at Bonsack Elementary School.

Daniel Wagner provided an update on DRPT (flyer with information is included in the Minutes).

Chair Jamison reminded members that next week is National Public Work Week.

9. COMMENTS BY MEMBERS AND / OR CITIZENS

No comments were made.

10. ADJOURNMENT

The meeting was adjourned at 2:37 p.m.

Cristina D. Finch, AICP, LEED AP, Secretary,
Transportation Technical Committee

Roanoke Valley Transportation Plan Update

Approach/Schedule/Solutions Update

presented to
Transportation Technical Committee

presented by
RVTPO, Cambridge Systematics, Inc.

CAMBRIDGE SYSTEMATICS 



Needs to Solutions

Need – Transportation problem or issue identified in the community currently. As described in the Needs Assessment, a need “states a problem, not a specific solution, and could be solved by multiple possible solutions”.

Priority Needs
The most critical multimodal needs consistent with regional goals, existing data, and stakeholder input

Solution – An idea of how the region can achieve desired results. Solutions address specific needs and contribute to meeting a regional objective. Some transportation solutions may lead directly to a project or service whereas others may require further study.



Needs to Solutions

Addressed Need – For many needs, proposed solutions and projects/services exist

Need addressed through a programmed (funded) project/service (SYIP/TIP)

Monitor performance outcomes once project/service is implemented

Gap Need – Focus on priority needs where potential solutions or projects/services do not exist (or are not fully funded)

Funded project/service does not yet exist – but an unfunded, proposed project or concept and/or study might exist

Identify potential and preferred solutions to further develop into projects/services (or future studies)



Needs to Solutions

Now through June TTC

1. Compare Needs to Projects

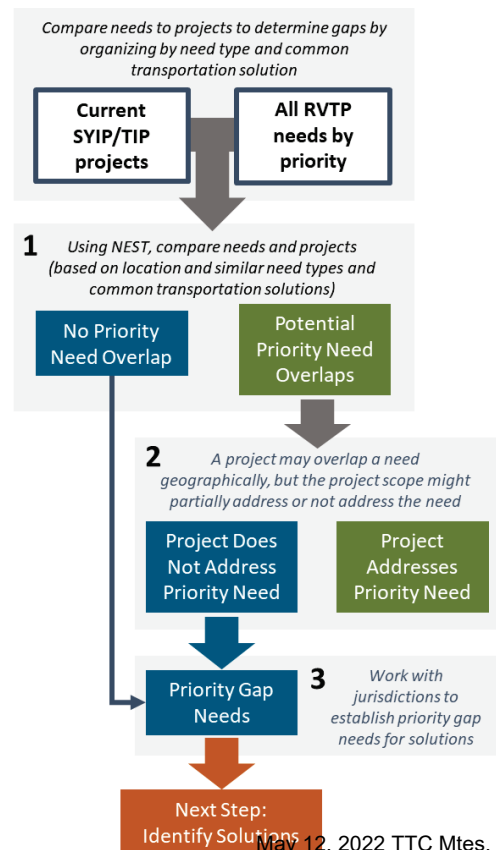
NEST enables comparison of RVTP needs with projects/services in the six-year improvement program (SYIP) and RTPO transportation improvement program (TIP).

2. Determine Overlaps

NEST enables comparison of transportation needs to the programmed projects/services to inform decisions on if needs are or are not addressed by these transportation investments.

3. Identify Priority Gap Needs

The RVTP team will collaborate with each member jurisdiction to review the comparison and determine the overlaps. This will lead to a priority gap needs list within each RVTP jurisdiction, representing a subset of all needs from the needs assessment.





Needs to Solutions

June – July

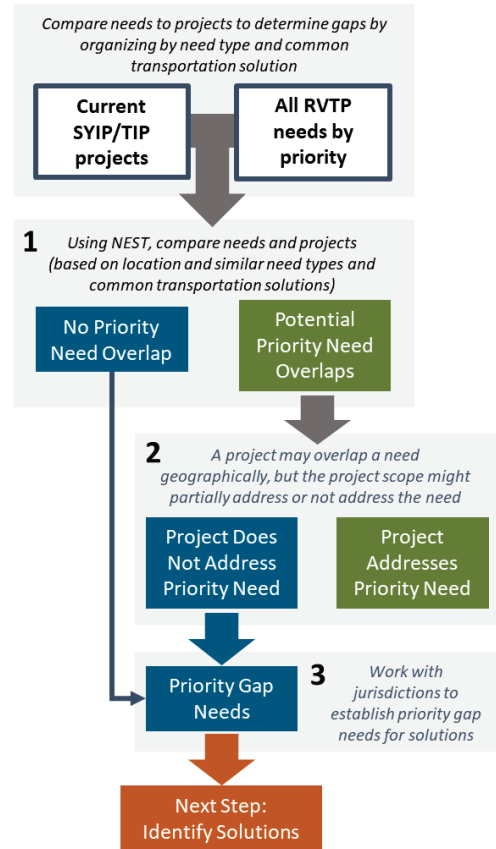
Proceed to Identify Potential Solutions

Solutions address specific transportation needs and contribute to meeting a regional objective. The solutions process will consider prior programmed or planned projects/services (from the existing RVTPO constrained and vision list projects, past plans/studies, and ongoing plans/studies such as STARS or Project Pipeline).

Translate Solutions into Projects/Services/Studies

Solutions will evolve into projects/services for consideration by the RVTPO as priority investments to pursue.

- Projects/services may be considered ready to compete for grant funding and inclusion in the SYIP and TIP.
- Projects/services could represent priorities for further development as a project/service over the next several years in order to prepare it for a future grant cycle .



Needs Evaluation and Solutions Tool

Toggles apply to both the map and table

Toggle location of needs

Toggle need type

Toggle project type and/or solution

RVTPO Needs Evaluation and Solutions Tool (NEST)

Roanoke Valley Transportation PLANNING ORGANIZATION REGIONAL COMMISSION

Select Prioritized Needs by Location

- Bedford Needs
- Boston Needs
- Montgomery Needs
- Roanoke City Needs
- Roanoke County Needs
- Salem Needs
- Vinton Needs

Select Prioritized Needs Type

- Prioritized Transportation Needs
- Need Type is: -All-

Select Programmed Project Type

- SYIP and TIP Projects
- Project Type is: -All-
- Transportation Solution is: -All-

UPC	LINK	Amendment	Amend4	ConstNum	Project Descript...	Project Source	State_ID
119452	http://tyip.virginia.gov/...	4	A4-18	A418		VDOT SYIP Y22	119452
T24740	http://tyip.virginia.gov/...	4	A4-19	A419		VDOT SYIP Y22	T24740
110887	http://tyip.virginia.gov/...	4	A4-46	A446		VDOT SYIP Y22	110887
113138	http://tyip.virginia.gov/...	4	A4-21	A421		VDOT SYIP Y22	113138

Expand / collapse table



Needs Evaluation and Solutions Tool

RVTP Needs Evaluation and Solutions Tool (NEST)

Select Prioritized Needs by Location

- Bedford Needs
- Botetourt Needs
- Montgomery Needs
- Roanoke City Needs
- Roanoke County Needs
- Salem Needs
- Vinton Needs

Select Prioritized Needs Type

Prioritized Transportation Needs

Need Type is: -All-

Select Programmed Project Type

SVIP and TIP Projects

Project Type is: -All-

Transportation Solution is: -All-

Project: TINKER CREEK TRAIL EXTENSION PHASE 2A

Tinker Creek Trail Extension

Multi-use urban biked/recreational trail following the Tinker Creek stream and connecting Fallon Park, Masons Mill Park, and Roanoke's Center for Industry and Technology. The proposed extension to the existing Tinker Creek Trail would provide for a

UPC: 110101

Project Source: VDOT SYIP Y22

RVTPO Project Title: Tinker Creek Trail Extension

UPC	Project Source	RVTPO Project Title	UPC	Project Source	RVTPO Project Title	UPC	Project Source	RVTPO Project Title	UPC	Project Source	RVTPO Project Title
109612	VDOT SYIP Y22	Tinker Creek Trail Extension	105439	VDOT SYIP Y22	Tinker Creek Trail Extension	110101	VDOT SYIP Y22	Tinker Creek Trail Extension	111360	VDOT SYIP Y22	Tinker Creek Trail Extension

Project details are also available in the attribute table

Switch attribute table to different layer

Projects selected in map are highlighted in the attribute table
Additionally, projects selected in the table are highlighted on the map



Next Steps (May-June)



Finalize RVTP NEST and meet with members

RVTP and TTC members to review and develop initial priority gap needs

Ongoing meetings (next two weeks) with member organizations to highlight priority gap needs



Use RVTP NEST to develop potential solutions for priority gap needs

Review priority gap needs and align with potential solutions

Share potential solutions with member organizations for review



TTC meeting (June)

RVTP team to brief TTC on potential solutions and prioritization approach



Develop preferred solutions for priority gap needs (by end of June)

RVTP and TTC members to develop preferred solutions and projects

Staff to coordinate with member organizations to reach conclusions on preferred solutions and projects

FY2023 Draft Six-Year Improvement Program

- DRPT released its Fiscal Year 2023 Draft Six-Year Improvement Program on April 20, 2022. A copy may be found on the DRPT Open Data Portal (<https://data.drpt.virginia.gov/>).
- DRPT and VDOT are currently hosting in-person district public hearings to receive comments about the Fiscal Year 2023 Six-Year Improvement Program. Information on the public hearings may be found here: <http://www.ctb.virginia.gov/planning/springmeetings2022/default.asp>

Transit Service and Delivery Advisory Committee

- The Transit Service and Delivery Advisory Committee (TSDAC) has begun work on updates to the MERIT Capital and Operating programs and Transit Strategic Plan (TSP) guidelines.
- Next scheduled TSDAC meeting is May 13, 2022 at the DRPT Office at 600 East Main Street, Suite 2102 in Richmond. Registration for online viewing may be found at <https://www.drpt.virginia.gov/transit/tsdac/>.

HJ 542 Transit Equity and Modernization Study

- The Virginia Transit Equity and Modernization Study team held a virtual forum on Thursday, April 21, 2022, from 10 a.m. to 11 a.m.
- Draft Action Plan is available for public comment through May 13, 2022. More information may be found on the study website: www.vatransitmodernization.com

DRPT Bike Month

- DRPT is encouraging all Virginians to participate in Bike Month this May, promoting biking as a commuting option.
- Bike to Work Day will be held on May 20, 2022.
- Social media, advertising, and events will be held throughout the month, raising awareness about the benefits of biking and availability of trails throughout the Commonwealth.
- Social media content and graphics are available to DRPT's partners at <https://bikeva.org/promotional-materials/>
- Partner agencies should contact DRPT about their Bike Month events to be included on the Bike VA events calendar.

**2022 TTC NOMINATING COMMITTEE REPORT &
 ELECTION OF OFFICERS
 TTC Meeting June 9, 2022**

At the May 12, 2022 TTC meeting, Chair appointed a Nominating Committee tasked with preparing a slate of nominees for the TTC offices of Chair and Vice Chair (two-year terms ending after the conclusion of the July 11, 2024 TTC meeting). The Nominating Committee consisted of Wayne Leftwich, Roanoke City and Mariel Fowler, Bedford County. A history of the TTC Chair and Vice Chair positions is shown in the table below.

Term Years	Chair	Chair's Agency	Vice-Chair	Chair's Agency
2020-2022	Mark Jamison (10/21-6/22)	City of Roanoke	Cody Sexton (11/21-6/22)	Town of Vinton
	Ben Tripp (7/20-9/22)	City of Salem	Mark Jamison (7/20-10/21)	City of Roanoke
2018-2020	Cody Sexton	Botetourt County	Ben Tripp	City of Salem
2016-2018	Cody Sexton	Botetourt County	Ben Tripp	City of Salem
2014-2016	David Holladay	Roanoke County	Liz Belcher	Greenway Commission
2012-2014	Michael Gray	VDOT	Mark Jamison	City of Roanoke
2010-2012	Michael Gray	VDOT	Mike Kennedy	Town of Vinton
2008-2010	Michael Gray	VDOT	Mike Kennedy	Town of Vinton

RECOMMENDATION:

The Nominating Committee is recommending:

Chair Cody Sexton, Town of Vinton
 Vice Chair Frank Maguire, Greenway Commission

Note: Additional nominations may be made from the floor during the June 9, 2022 TTC meeting.

TTC ACTION: Election of a TTC Chair and Vice Chair for a two-year term ending at the conclusion of the July 11, 2024 TTC meeting.

TPO POLICY BOARD: Cities of Roanoke and Salem; Counties of Bedford, Botetourt, Montgomery and Roanoke; Town of Vinton; Greater Roanoke Transit Company (*Valley Metro*); Roanoke-Blacksburg Regional Airport; Virginia Department of Rail & Public Transportation; Virginia Department of Transportation

STAFF REPORT
TTC Meeting June 9, 2022

SUBJ: Continued Development of the Roanoke Valley Transportation Plan

The RVTP plan development team continues to implement the new performance-based planning process being developed by the OIPI GAP-TA team to define common transportation solutions, determine priority gap needs, and identify potential solutions.

1. Compare Needs to Projects

The NEST enables comparison of RVTP needs with projects/services in the six-year improvement program (SYIP) and RVTP transportation improvement program (TIP). Needs information includes all details from the needs assessment, including the needs priority outcome.

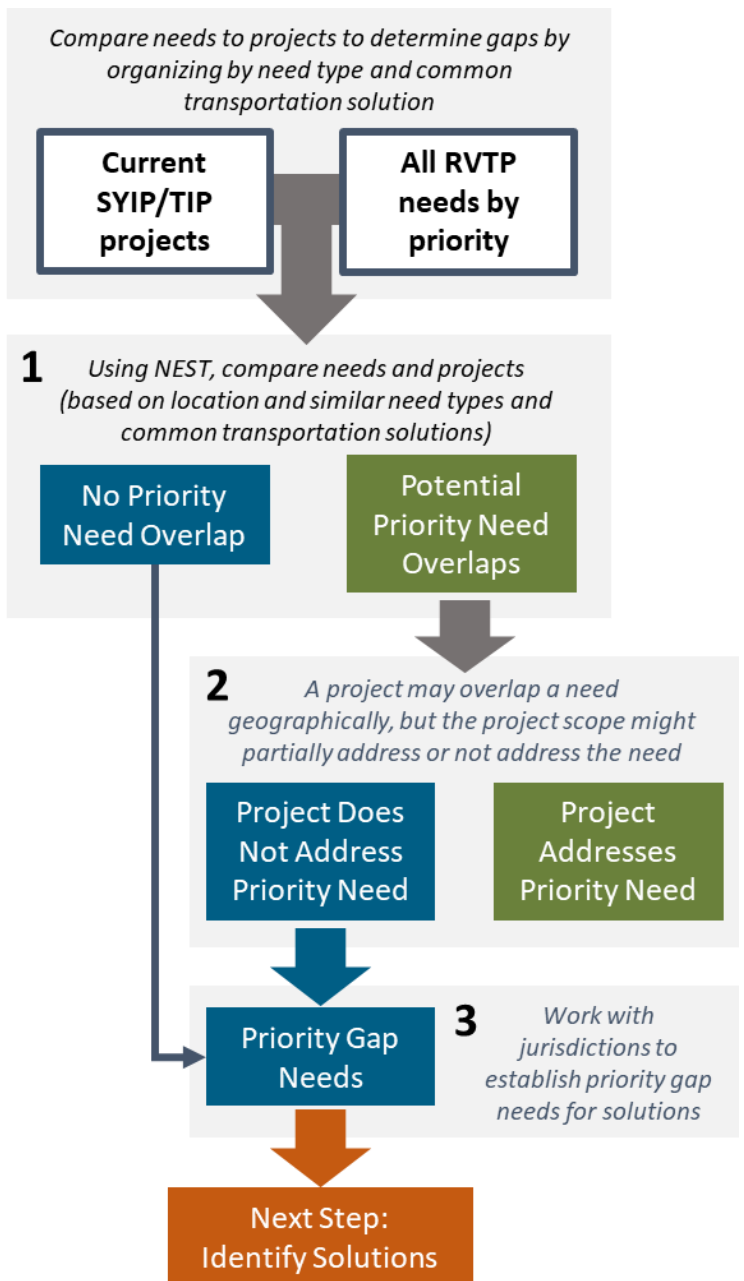
Status update – The RVTP team shared the NEST and met with individual TTC members and other locality staff to discuss the review process, demo the tool, and discuss priority gap needs.

2. Determine Overlaps

The NEST enables comparison of needs to the programmed projects/services to inform decisions on if needs are or are not addressed by these transportation investments. The outcomes of this review will include a list of needs that are addressed by projects/services and a list of priority needs that are partially or not addressed.

Status update – The RVTP team and each TTC member are comparing needs to programmed projects through the NEST to determine which needs are addressed versus which needs represent a gap.

Process to Develop Priority Gap Needs
 (aligns generally with Phase II as presented in Figure 1 in the GAP-TA solutions process document within the June TTC agenda packet)



3. Identify Priority Gap Needs

The comparison process in step 2 leads to a priority gap needs list within each RVTPO jurisdiction, representing a subset of all needs from the needs assessment. Depending on jurisdiction size and number of needs, the number of priority gap needs will vary. Also, the RVTP team and member organizations will keep the process flexible, identifying lower priority needs as priority gap needs based on people's perspectives and justifications on regional priorities.

Needs that may be gaps, but are not considered priorities, will be retained in the tool and documented within the RVTP, however will not (at least for this initial implementation of this new process) be considered within the solutions development process for this version of the RVTP.

Status update – The RVTP team developed an initial list of 50 priority gap needs based on initial member feedback during meetings and RVTP team use of the NEST to determine addressed versus gap needs (starting from the highest scored priority needs). TTC members are providing feedback to modify/expand this list based on local insight and priorities.

Next Step: Identify and Prioritize Potential Solutions

The solutions process will consider prior programmed projects/services, planned projects/services (from the existing RVTPO constrained and vision list projects and past plans/studies), and ongoing plans/studies such as STARS or Project Pipeline. Recommended projects and services from completed plans/studies are available in the NEST, enabling a comparison of priority gap needs to these efforts. The RVTP team and TTC members may also consider any other unique transportation or non-transportation solution to address the need that may not have been raised during the original plan/study process.

Where these recent and ongoing planning efforts are anticipated to address the priority gap need, the RVTP team will utilize the OIPI GAP-TA team's suggested solutions prioritization process (**refer to Phase 3, step 8 and step 9 in the GAP-TA solutions process document**) to prioritize these solutions into the next phase of developing and prioritizing projects.

If there is no recent or ongoing planning effort addressing the priority gap need, the RVTP team will work from the common transportation solutions list to develop a set of options to address the need and consider the applicability of unique transportation or non-transportation solutions to address the need. Where there is no obvious preferred solution, or additional study needs to be conducted, the RVTP will identify these needs as opportunities for additional future analysis as part of the ongoing transportation planning process.

Status Update: The RVTP team is now developing a list of potential solutions for each initial priority gap need and determining a preferred solution based on the prioritization process. As the priority gap needs are refined (as noted in Step 3 above), the RVTP team will update the potential and preferred solutions. Later in June, the potential and preferred solutions will be shared with TTC members for review and comment. Interim outcomes from this process will also be shared with the Policy Board at its June meeting.

July and Beyond: Translate Solutions into Projects/Services/Studies

Solutions will evolve into projects/services for consideration by the RVTPO as priority investments to pursue. These projects/services will represent those that address the highest priority needs in the region. These projects/services may be considered ready to compete for grant funding and hopeful inclusion in the forthcoming updates to the SYIP and TIP. Alternatively, the projects/services could represent priorities for further development as a project/service over the next several years in order to prepare it for a future grant cycle.

Where there are needs that require more in-depth study/analysis, the plan will record it as such. These efforts could be pursued by the RVTPO and its local and state partners and may be noted within future unified planning work programs. The results of these studies may become projects that are included in future RVTPOs, compete for funding and reflected within future SYIPs and TIPs.

Next Steps

- The NEST is available here:
<https://experience.arcgis.com/experience/7c2b2fb55b1b42c58954799c2156b922/>

Updates have been made over the past month, and members are invited to provide feedback on how this new tool can be made easier to use.

- The RVTP team will work with TTC members to reach consensus on priority gap needs based on feedback received during meetings and subsequent reviews. Additional feedback on regional priority gap needs is welcome by the June 9 TTC meeting prior to moving into the Solutions phase.
- The RVTP team will identify potential and preferred solutions for each priority gap need consistent with the process outlined by the GAP-TA team and share initial outcomes with TTC members for review and comment later in June.
- Following review of preferred solutions, the RVTP team will progress into identifying projects/services for the preferred solutions to priority gap needs for potential inclusion in the RVTP.

TTC Action: None.

Task 4:

PROCESS FOR IDENTIFYING AND EVALUATING SOLUTIONS TO TRANSPORTATION NEEDS

Solutions Development Process

The process for identifying and evaluating solutions to transportation needs is intended to be implemented as part of the Roanoke Valley Transportation Plan (RVTP) development process after the identification of objectives and system performance measures (task 3). It directly precedes the identification and prioritization of projects (task 5). This process is intended to allow for the identification and prioritization of infrastructure and policy solutions and to account for new solutions that have not historically been implemented in the region non-transportation solutions to transportation problems. The process combines different kinds of inputs ranging from historical projects to best practices research and stakeholder involvement to capture the breadth of possible solutions and their areas of appropriate application.

The process was developed by considering national best practices in light of the Roanoke Valley Transportation Planning Organization's (RVTP) intent for the process and the data that is likely to be available for process execution. The process synthesizes elements of four primary approaches, namely stakeholder involvement, analysis of existing and committed projects, engineering and planning judgment, and automation to generate recommendations.

The proposed process has three phases, each comprised of multiple steps as summarized in Figure 1. Phase I defines common transportation solutions that could support the region's goals and objectives. Phase II takes the prioritized transportation needs and recently completed, existing, and committed projects to identify needs without a solution in progress (gap needs) and potential solutions. Finally, phase III evaluates the potential solutions to prioritize them and select a preferred solution for each need evaluated based on several criteria that are used to evaluate infrastructure and policy solutions. The following sections detail each of these phases.

Definitions of Terms

There are several terms that are important for understanding the proposed process. These terms are defined below.

Need – Transportation problem or issue identified in the community currently. As described in the Roanoke Valley Transportation Needs Assessment, a transportation need “states a problem, not a specific solution, and could be solved by multiple possible solutions.”¹

Gap Need – A need without a funded project or service.

Addressed Need – A need with a recently funded solution to be reviewed for performance outcomes prior to any further solutions identification, if needed.

Solution – An idea of how the region can achieve desired results. Solutions address specific transportation needs and contribute to the realization of a regional objective. Some transportation solutions may be simple enough to lead directly to a project whereas others may require further study/analysis.

Project – A specific scope of work describing how the solution will be implemented including start/end points, length, and cost.

Study/Analysis – Additional work required to identify possible solutions or derive a project from a solution.

Solutions Identification – The development of a universe of possible solutions (including non-transportation solutions) that can respond to a transportation need.

Solutions Evaluation – The prioritization and winnowing of solutions in response to a particular need. This evaluation may be a function of location-specific, organizational, and / or regional characteristics.

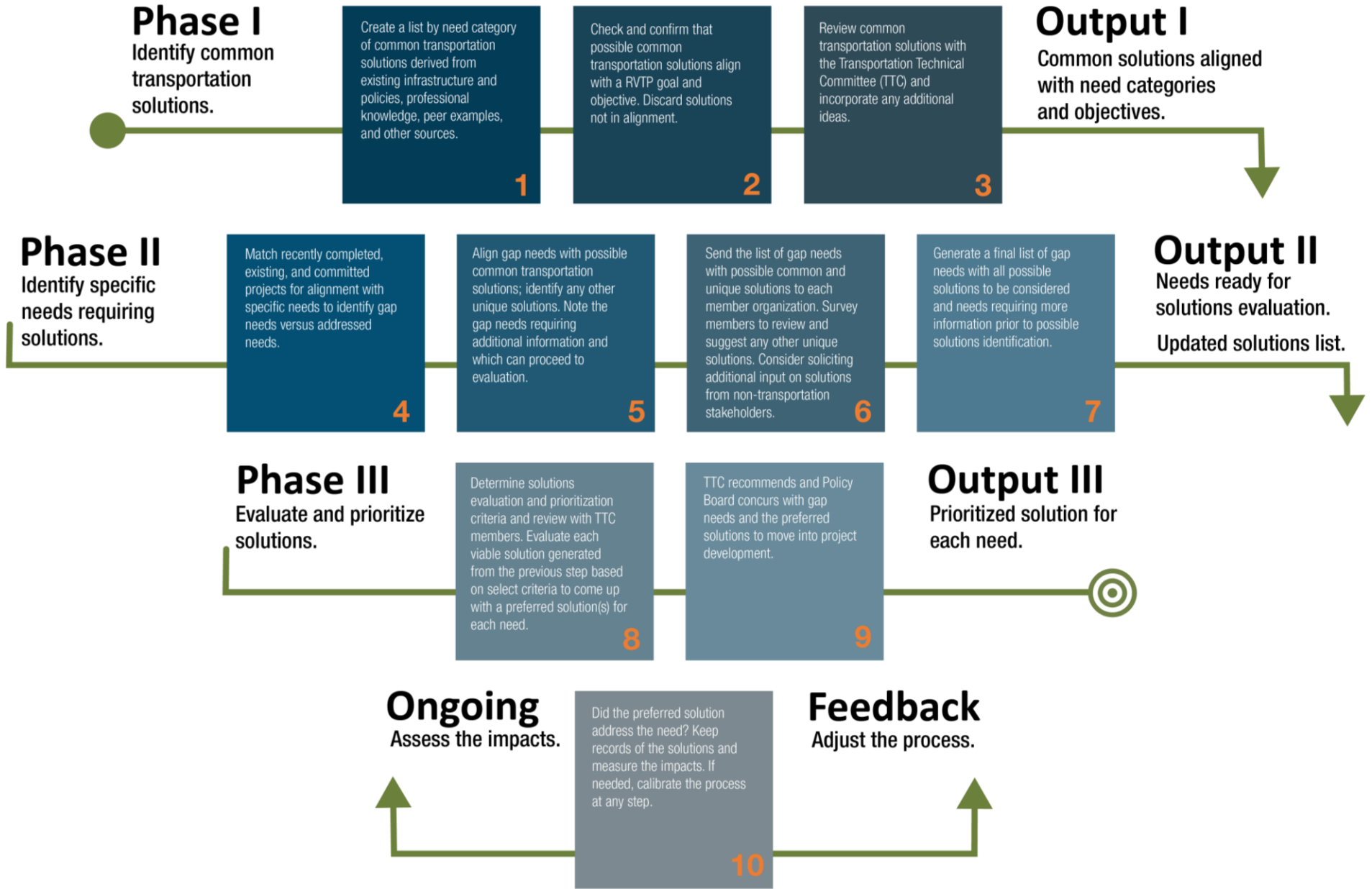
Common Solution – A transportation solution deriving from sources that are not related to the context of a particular need, such as past projects, peers, and best

¹ RVTP (2021). Roanoke Valley Transportation Needs Assessment. Approved April 22, 2021.

practices. It contrasts with unique solutions, which derive from a particular need's context.

Unique Solution – A solution deriving from the context of a particular need, in contrast to a common solution, which derives from past projects, peers, or best practices before being applied to a particular need. Unique solutions may be transportation or non-transportation solutions.

Figure 1: Solutions Identification and Evaluation Process Flow Chart



Phase I: Identifying Common Transportation Solutions

Phase I determines the options for addressing the region's transportation needs by defining common transportation solutions. Infrastructure solutions are drawn from recently completed, current, and historical project lists, professional knowledge, peers, and other sources (step 1). These solutions are aligned with RVTPO goals and objectives to ensure that each solution supports the future that the region has envisioned (step 2) before soliciting feedback from the Transportation Technical Committee (TTC) (step 3). The following subsections describe the inputs and deliverables from the process, along with each of the three steps.

Phase I Inputs

The following inputs are needed for execution of phase I.

- a. **Projects from Transportation Improvement Program (TIP) for fiscal years 2021-2024:** <https://rvarc.org/transportation/mpo-urban-transportation/tip/>.
- b. **Projects from Vision 2040:** Roanoke Valley Transportation Plan (2017). <https://rvarc.org/transportation/mpo-urban-transportation/long-range-plan/>.
- c. **Project features:** List of project features presented by the Office of Intermodal Planning and Investment (OIPI).²
- d. **Plans/studies:** These state, regional and local plans and studies are intended to provide solutions to populate the solutions list. Plans and studies to be examined are included in Appendix A along with any other studies underway.
- e. **Prioritized needs:** The transportation needs refer to the needs derived from the Roanoke Valley Transportation Needs Assessment that was approved on April 22, 2021.
- f. **Final goals and objectives:** The final objectives are identified using the process defined in Task 3. The goals refer to the transportation plan goals, which were identified in May 2021.
- g. **Research material:** Sources for researching best practices and/or access to peers.
- h. **Future factors summary:** The *Roanoke Valley Transportation Plan – Future Factors* summary document dated July 28, 2021.
- i. **Feedback** from Transportation Technical Committee (TTC).

Phase I Deliverables

The output of phase I is a table listing common solutions that are typically implemented in response to each

transportation needs category and those solutions' alignment with regional objectives. Appendix B includes a template of the table to be populated (Table 2).

Step 1: Develop List of Common Transportation Solutions

The RVTPO's staff or consultant team will review projects from the current transportation plan, from one or more previous transportation improvement programs (TIPs), or other known improvements. The intent is to identify common solutions implemented through similar elements of projects based on the project descriptions and / or scopes. Common solutions are those that derive from past projects, peers, best practices, and other sources that do not consider a particular need's context in defining the solution. The solutions derived in this step are a first draft of possible solutions to transportation needs. Appendix C shows a list of example solutions derived from the fiscal year (FY) 2021-2024 TIP.

Searching project scopes or descriptions by key word such as "widening," "new lane," "auxiliary lane," and "roundabout" is recommended to automate the categorization of project elements into common solutions. The key words and their association with possible solutions will be developed through exploratory analysis. A project may address more than one need, and the possible solutions are intended to be precise enough to guide eventual project development while allowing for the specific project details to be selected based on more detailed analysis and site conditions. It is not necessary to analyze all possible solutions, as long as a large and representative sample is examined.

The RVTPO's staff or consultant team executing the RVTTP will supplement these draft common solutions with other sources to flesh out the list for new project types that have not previously been implemented in the Roanoke Valley. The purpose is to derive potential transportation solutions from peers, best practices, and studies. One such source is the list of project features that OIPI uses for some SMART SCALE processes, which provides a fairly comprehensive set of common transportation solutions. A screenshot from a Virginia Office of Intermodal Planning and Investment (OIPI) presentation is in Appendix D. Additionally, RVTPO / consultant staff will review best practices, other plans and studies, and peers to complete the list of common transportation solutions.

Best practices: Potential sources for best practices research include the following:

1. Transportation Research Board presentations

² Office of Intermodal Planning and Investment (2021). SMART SCALE. Presentation by Brooke Jackson to the RRTPO Technical Advisory Committee. November 8, 2021. Retrieved from <https://youtu.be/p1QJMby966E?t=2840>.

2. Publications by the Transportation Research Board (TRB), including National Cooperative Highway Research Program (NCHRP), National Cooperative Transit Research Program (NCTRP), National Cooperative Railroad Research Program (NCRRP), and National Cooperative Freight Research Program (NCFRP) reports
3. Transportation journals
4. Publications by organizations such as the Lincoln Institute of Land Policy and the American Planning Association (APA)

Plans and studies: Many existing regional and local plans and studies define solutions or provide recommendations from which more generalized solutions can be derived. These studies are listed in Appendix A.

Peer Research: If possible, a handful of peer metropolitan planning organizations (MPOs) can be examined through plan reviews and interviews to assess any innovative or creative solutions that they have considered and/or used. It is recommended to select MPOs that vary by size and location to create variety in the solutions that they use.

Future Factors: While the future factors related to technology, society, economy, sustainability, and funding & finance do not dictate solutions, they do provide context for where the region is going and for the breadth of solutions that may be required in the future. The future factors should be consulted while developing lists of common solutions to make sure that at least some of the solutions identified will help the region prepare for these future factors. If very few of the solutions would help the region prepare for future factors, then the future factors may merit special attention in the development of unique solutions in phase II. Appendix E lists the future factors.

At this point, it is not necessary to evaluate the RVTP's level of influence over implementing the solution since the purpose is to define a broad set of potential solutions to each problem. The output from this step is a list of common transportation solutions to transportation needs.

Step 2: Check Alignment between Common Transportation Solutions, and Goals and Objectives

Each common transportation solution is assessed to ensure that realization of the solution will promote one or more of the regional objectives as described in the RVTP. Solutions that do not promote achievement of at least one objective are removed. Implementation of solutions should uniformly advance the region toward its goals and objectives, although there may be trade-offs among objectives. Additionally, at this step the solutions are aligned with the needs categories such that it is possible

to say for each category which transportation solutions could be considered to resolve it. Solutions can be aligned with more than one need category.

Step 3: Review Common Transportation Solutions List with Transportation Technical Committee (TTC)

The TTC reviews the common transportation solutions list to provide feedback or add other solutions. Feedback may include new solutions to consider, changes to the way in which solutions are categorized or described, changes to the needs or objective alignment, or elimination of solutions that are unlikely to be useful. Questions to ask the TTC that may generate helpful feedback include the following.

1. Are there other solutions that should be included?
2. Do any of these solutions appear infeasible in our region, even over the long term?
3. Do any solutions appear unrelated to the resolution of the need that they are aligned to? If so, this could indicate either a problem with how the solution is explained or an error in its alignment to the need.

Phase II: Identify Specific Needs Requiring Solutions

The purpose of phase II is to identify gap needs, assign common solutions to gap needs, and identify unique solutions to gap needs. Needs are matched to relevant recently completed, existing, and committed projects to identify addressed needs and reveal gap needs (step 4). At this point, common transportation solutions are assigned to priority gap needs, and unique solutions for these needs are identified (step 5). Gap needs and their common and unique solutions are shared with each locality to review and identify any other possible unique transportation or non-transportation solutions to consider for that particular need (step 6). This produces a list of gap needs with matched common and unique solutions (step 7). The following subsections detail the phase II inputs and deliverables, along with each step.

Phase II Inputs

The following inputs support phase II execution.

- a. **Phase I deliverable:** The table that aligns potential solutions with needs categories and regional objectives.
- b. **Prioritized transportation needs:** As derived from the Roanoke Valley Transportation Needs Assessment that was approved on April 22, 2021 and subsequent needs prioritization methodology.
- c. **Recently completed, existing and committed projects:** Projects which have been recently completed, for which construction has begun, or for which funds have been committed, as listed in

the fiscally constrained TIP and the RVTPO Annual List of Federally Obligated Transportation Funds.

- d. **Plans and studies:** Select plans and studies to examine are listed in Appendix A along with any others underway.
- e. **Stakeholder feedback:** Localities are consulted to generate unique solutions for particular needs.
- f. **Feedback** from the Transportation Technical Committee (TTC).

Phase II Deliverable

Phase II produces a list of gap needs requiring a solution with all potential solutions to each gap need. Depending on the quantity of gap needs, it is possible to focus on priority gap needs and continue matching lower priority gap needs with solutions in subsequent years. Appendix F includes a template of the final product. The second phase II deliverable is a revised solutions list to include the unique solutions generated through stakeholder input in phase II.

Step 4: Match Needs with Recently Completed, and Existing and Committed Projects to Identify Gap Needs

Projects are matched to needs based on their ability to solve a specific need. Projects are overlaid with needs via geographic information systems (GIS) analysis to determine which projects may resolve a given need, and then each project is assessed for its ability to fully or partially resolve the needs that they overlap. Projects often spatially overlap needs to resolve them, though not always, such as congestion or reliability needs where a project at one location can resolve issues downstream or safety needs where routing travelers to an alternate route was determined to be the preferred solution. Additionally, non-spatial needs should be reviewed to assess if and how existing and committed projects will address them.

The RVTPO staff / consultant team will use recently completed, existing and committed projects to identify addressed needs. Addressed needs are those needs for which a project that is recently completed, currently underway, or programmed for construction is expected to cover the need.

All other needs without recently completed, existing or committed projects will be considered “gap needs”. Gap needs could be covered by other planned projects, for example, projects in the fiscally constrained Vision 2040 plan, vision list projects, or other recommendations from recent plans or planning studies. Gap needs also may have no recent planning or project development activity, representing an opportunity for assessing possible solutions.

The result of this step is the distinction between gap and addressed needs.

Step 5: Align Gap Needs with Possible Common Transportation Solutions

In this step, RVTPO / consultant staff align gap needs with possible common transportation solutions and identify any other possible unique transportation or non-transportation solutions. Some needs can be addressed through policies, such as how enforcement measures can remedy some safety needs, while others might be addressed through non-transportation factors such as land use and development-related policies. Below are some examples of transportation needs that may be solved through non-transportation solutions.

- A need for access to a given service can be provided by moving all or portions of the service online or to one or more geographically central locations.
- A perceived need for motorist/pedestrian safety around a homeless shelter can be addressed by improving housing access or improving shelter conditions.

The RVTPO / consultant staff will also brainstorm unique transportation and non-transportation solutions for each need. In some cases, the gap need may require more information to better understand the need before progressing to solutions evaluation. In some cases it may be determined that the need is not a regional transportation need and may be referred to another agency.

Step 6: Send List of Gap Needs with Possible Solutions to Member Organizations

This step elicits feedback from member organizations about any other unique or non-transportation solutions to consider.

Unique transportation solutions: RVTPO / consultant staff will share a list of the gap needs and their potential solutions with each member organization to allow them to consider where other unique solutions might exist. Additionally, member organizations may be requested to provide feedback on their preferred solutions and on unique solutions via a survey or at a meeting with RVTPO staff.

As time allows, RVTPO / consultant staff may moderate a workshop with the localities to identify the needs where other unique solutions may exist and to jointly describe these solutions. Future factors may be discussed at this workshop so that participants consider not only where the region is today but also the conditions that the solutions may need to respond to in the future. Localities’ preferences will inform designation of a preferred solution.

If there are a lot of needs with unique solutions in each locality, then it is best to host separate workshops or meetings for each locality. If the number of needs is small, then holding a common workshop for all or several localities may generate more creative solutions through the dialog among localities and the facilitators.

Unique non-transportation solutions:

Non-transportation stakeholders may participate in the workshops and may be consulted to generate unique non-transportation solutions to priority gap needs and to assess stakeholders' support for these solutions, their feasibility, and potential implementation roles.

There are three substeps in consulting non-transportation stakeholders.

1. Identify additional stakeholders in local and state government that might have insights into unique solutions regardless of whether the stakeholder might have any responsibility for implementing the eventual solution. Potential stakeholders may include local planning departments, local police, housing authorities, social services, libraries, and parks and recreation.
2. Contact these stakeholders to explain the work, request their involvement, and describe how their involvement may improve the region. When possible, relate the request to the organization's mission and possibilities to help achieve their mission through the connections resulting from their involvement since this may increase buy-in and likelihood of participation.³
3. Invite these stakeholders to the workshop with locality staff or organize a separate workshop to convene participants from these stakeholders to discuss transportation needs to which a non-transportation solution may be possible. It may help to prime discussion by describing categories of needs and having maps or photos illustrating the needs. Begin discussion with brainstorming about potential solutions without immediately narrowing the list by feasibility or responsibility for implementation to generate as large a list as possible. As the workshop continues, it can be helpful to focus on better defining the solutions, assessing feasibility, and potential implementation roles. If the solution is mutually beneficial to the participants' organization and the RVTPO, this information is important to point out. When possible, record the participants' preferred solution.

Step 7: Generate Final List of Potential Solutions Aligned with Gap Needs

RVTPO / consultant staff consolidates the output of the prior steps in this phase into a single list of priority gap needs with a set of potential solutions assigned to each. The list should include a unique identifier for each need that can be used to join the solutions to a specific point or line in a spatial file such as a shapefile or geodatabase of prioritized needs. Note that not all needs are spatial, so some needs and their solutions may not include spatial data. Appendix F includes a template for the final product. At this step, needs requiring more information prior to possible solutions identification are flagged.

Phase III: Evaluate and Prioritize Solutions

Phase III uses the phase II deliverables to evaluate and prioritize solutions. The solutions for each need are evaluated (step 8), allowing staff to recommend a preferred solution for each need for TTC recommendation and Policy Board Concurrence (step 9). The following subsections details the phase III data inputs, deliverables, and steps.

Phase III Inputs

Phase III requires the following inputs—

- a. **Phase II deliverable:** The list of gap needs requiring a solution with potential solutions assigned to each.
- b. **Stakeholder feedback:** Stakeholders are consulted about solutions' appropriateness for resolving specific needs.
- c. **RVTP goals, objectives, and performance measures:** The final RVTP goals, objectives, performance measures and supporting data sources to inform solution ratings.
- d. **Future factors summary:** The *Roanoke Valley Transportation Plan – Future Factors* summary document dated July 28, 2021.
- e. **TTC review:** Feedback from the TTC on goal and criteria weights, and on preferred solutions.

Phase III Deliverables

Phase III produces the following deliverables—

- a. List of needs referred for further study before a preferred solution is selected.
- b. A preferred solution for needs. In some cases, this may include a short-term and a long-term solution.
- c. List of needs with a preferred solution to be further developed into a project.

³ In future version of the RVTP, including select non-transportation stakeholders in RVTP committees may increase buy-in to the solution and garner feedback about areas of synthesis with non-transportation functions for other parts of the plan.

Step 8: Determine Solutions Evaluation/Prioritization Criteria, Prioritize Solutions, and Identify Preferred Solutions

RVTPPO / consultant staff draft solutions evaluation criteria and finalize with input from the TTC. Using the criteria, RVTPPO / consultant staff evaluate the solutions applied to the gap needs and meet with locality staff to review resulting priorities and adjust as necessary. Given the feedback, RVTPPO / consultant staff note a preferred solution for each need for TTC review, revision, and / or recommendation to the Policy Board for progression to the project phase.

This section details the process for evaluating solutions and selecting preferred solutions. The process is described with two example criteria shown in Table 1, one related to the solution’s efficacy and another related to its potential to generate unintended new needs. Each solution is rated for its efficacy in advancing the region toward its objectives. The better the solution promotes regional objectives that are relevant to the need that it resolves, the higher its score. Each solution is also rated on its likelihood to produce unintended new needs through its implementation within each of the region’s goals. The more likely a solution is to produce unintentional new needs or exacerbate existing needs, the lower its score. These objective and goal ratings are then weighted, summarized, and combined as described in the following sections to produce a single score for each solution that can be used to compare it with other solutions for the same need.⁴ Consider documenting the rationale for the rating given for future reference.

Table 1: Example Evaluation Criteria

Criteria	Rating	Considerations
Efficacy	Highly Effective (3), Moderately Effective (2), Somewhat Effective (1), or No Effect (0).	How effective is the solution expected to be at advancing the region toward its objectives?
Potential to Generate Unintended New Needs	Highly Unlikely (3), Unlikely (2), Likely (1), Certain (0)	What is the likelihood that this solution would exacerbate or create another problem or need?

1. **Criterion on Efficacy:** The efficacy criterion refers to the ability of the proposed solution to effectively

achieve the objectives by addressing the transportation need. The following steps should be followed for each solution to calculate an efficacy score.

- 1.1. Score each objective that is relevant to the need that it solves from 0 (No Effect) to 3 (Highly Effective) for its ability to advance the objective. The score could be derived quantitatively based on a solution’s potential impact on the objectives’ performance measure, or it can be based on planning or engineering judgment supported by research.
- 1.2. Sum the scores within each goal area and divide by the maximum score possible, which is the product of 3 by the number of objectives within the goal.
- 1.3. Weight the goal-level score by goal weights. This can be done by multiplying the output for the previous step by the goal weight. Guidance for determining goal weights is provided in the following section.
- 1.4. Sum the result of the previous step across the RVTP goals to produce an efficacy score.

2. **Criterion on Potential to Generate Unintended**

Needs: Identify the negative effects that the proposed solution may have in the future and determine the degree to which the solution may generate unintended new needs or exacerbate other existing needs related to each RVTP goal. The unintended needs scoring process may involve the following considerations for each solution:

- 2.1. Score each objective from 0 (Certain) to 3 (Highly Unlikely).
- 2.2. Divide the score from the previous step by the maximum score possible (which is 3) to normalize.
- 2.3. Multiply the scores from the previous step by goal weights by multiplying the two numbers together. Use the same goal weights as for the efficacy criterion.
- 2.4. Sum the result of the previous step across the RVTP goals to produce a score for the criterion.

Goal Weights

It is recommended to weight each goal area so that the goals that are more important to the TTC and the Policy Board influence solutions’ criteria scores more than those that are less important. Weights should sum to 100%. Goal weights may be assigned in multiple ways:

1. RVTPPO and consultant staff may consider the

⁴ Roanoke Valley Transportation Planning Organization (2022). TTC Special-Called Meeting, Staff Report. January 5, 2022. Pages 17-21. Retrieved from <https://rvarc.org/wp-content/uploads/2022/01/RVTP-Staff-Report-2.pdf>.

goals against each other and propose weights for each that sum to 100%. This method is appropriate if consensus can be achieved about goals' relative importance. As a starting point, the group might consider weights used for SMART SCALE.⁵

2. There may be cases where discussion does not lead to consensus about the overall weights but there is consensus about how each goal relates to the other goals individually. In this case, pairwise comparison among goals can allow overall weights to be derived. Analytical Hierarchy Processing (AHP) provides one such scale and calculations for assessing importance.⁶

3. A final option is to assign equal weights to all goal areas, which may be done if there is not consensus about the relative importance of goals. The decision to assign equal weights to goals should be taken explicitly rather than done by default.

Combined Scores

The next step of the solutions rating process is combine each solution's scores across the criteria to generate a single score for each solution. Weights for the criteria may be determined similarly to goal weights. The team may discuss the criteria's importance and select weights that reflect their relative importance. The criteria may also be given equal weight if the criteria are deemed to be equally important. Weights should sum to 100%. Whichever methods are selected, RVTPO and/or consultant staff will derive weights and the TTC will provide feedback before the weights are finalized.

Combined scores are produced by summing the product of the criteria weights and scores across the two criteria.

Future Factors

RVTPO has identified future factors related to technology, society, the economy, sustainability, and funding and finance. These factors may impact the appropriateness of certain transportation solutions. For instance, transportation solutions that help the region adapt to one or more future factors would help the region beyond meeting the need(s) that they are selected to address.

Future factors may be considered in the solutions process by multiplying the combined score by a future factor adjustment. The score can be raised by 5% or another amount selected by the TTC for each future

factor theme for which the solution helps prepare the region. If 5% were used as the multiplier, solutions could receive up to a 25% bonus if they helped the region respond to all future factors. Appendix E lists the future factors.

Final Scores

Final scores are the combined scores plus the adjustment for future factors. They are used to identify the solution with the highest overall score. In cases where solutions' scores are similar or where locality staff disagree about the preferred solution, the RVTPO / consultant team should gather stakeholder feedback and / or TTC input for assistance. The solution that most comprehensively meets the criteria is the recommended solution for the need.

A solutions evaluation template is provided in Appendix G.

Selection of Multiple Solutions for a Given Need

It may be appropriate to pair the preferred solution with one or more high-scoring solutions to address the need fully or address it over short and long timeframes. Each potential solution should also be assessed for its ability to resolve the need(s) with which it is paired. This step takes place after scoring solutions because the intent is not to score solutions but to identify when multiple high-scoring solutions should be pursued in tandem to resolve a need. When the preferred solution is inadequate to address the entirety of the need, one or more additional high-scoring solutions may be retained to also address the need such that some needs may have more than one solution assigned to them. Solutions can be evaluated for their ability to resolve the entirety of the need on the example scale listed below.

- Solution is likely to resolve the entirety of the need (3 points)
- Solution may resolve the entirety of the need when paired with one or more other solutions (2 points)
- Solution may not resolve the entirety of the need even when paired with other solutions (1 point)
- Solution does not resolve the need (0 points)

Following the example scale, solutions receiving zero points should be discarded, preferred solutions receiving 3 points should be retained without any other solutions on the same time horizon, while preferred solutions assigned either 1 or 2 points may be paired with other high-scoring solutions to the same need. The pairing should ideally be done such that solutions that are paired address different aspects of the need. For instance, a congestion need may

⁵ Office for Intermodal Planning and Investment (2022). "SMART SCALE - How to Works." Retrieved from http://smartscale.org/how_it_works/default.asp.

⁶ Coyle, G. (2004). Practical strategy, open access material. AHP. Retrieved from <https://training.fws.gov/courses/references/tutorials/geospatial/CSP7306/Readings/AHP-Technique.pdf>.

be caused in part by freight traffic and in part by passenger traffic. A solution involving travel demand management might address the passenger traffic component of the needs and be paired with a solution involving freight rail, which might address the rail component of the need.

Additionally, it may be desirable to retain two high-scoring solutions for a given need when the two solutions are on a very different timeframe. In this case, there can be a preferred short-term solution that can be pursued during the next five years between transportation plan updates and a long-term solution that would involve a longer pursuit period to more completely resolve the need over a longer time horizon. Most needs are not expected to have a short-term and long-term solution, with the option of two solutions remaining open for a minority of needs where the highest-scoring and/or most effective solution will take many years to implement. For instance, a congestion need might be partially resolved in the short term with additional roadway capacity while over the long term a more effective solution given expected population and employment growth might be coordination between land use and transportation.

Step 9: RVTPO Decision

The TTC considers the preferred solutions identified along with any additional high-scoring solutions retained. In many cases, the preferred solution will be the one ultimately recommended by the TTC to the RVTPO Policy Board, although sometimes there may be location-specific considerations that make the solution that has been designated as the preferred solution different from the one ultimately chosen. If the TTC is not comfortable making a recommendation and believes that additional study is required, it can also refer a need for ad hoc analysis or a formal transportation study.

Once a course of action is selected, RVTPO staff and/or the consultant team should ensure solution follow-up. For transportation solutions, follow-up will occur at least in part through the project identification and prioritization process. Implementation of policy solutions may require coordination with the RVTPO Policy Board or coordination between consultant or RVTPO staff with policy branches in stakeholder organizations. Implementation of non-transportation solutions will likely depend heavily on partnership with stakeholders, many of which may have been involved in the identification of non-transportation solutions. It would build momentum to begin implementation with non-transportation solutions for which stakeholders have indicated high buy-in and the potential to take an ownership role. After these quick-wins have been realized, consultant or RVTPO staff can pursue meetings with other stakeholders that may play a role in implementation.

Ongoing Activity

Step 10: Ongoing Assessment and Feedback

When the TTC recommends and the Policy Board selects a preferred solution that is different from the one recommended by the evaluation criteria, RVTPO / consultant staff should record these decisions and use them to adjust the evaluation criteria and/or criteria weights in future iterations. Additionally, data about how well the selected solution resolved the need should be collected to refine the solutions evaluation criteria and weights.

Other refinements may be made to the process as time allows. One such refinement to consider is the establishment of decision guidelines to assess common solutions' viability for a given need before scoring the need through evaluation criteria. Steps to develop decision guidelines are provided in Appendix H.

Appendix A – Relevant Plans and Studies

Relevant Plans and Studies

Plan	Locality	Year
419 Town Center Plan	Roanoke County	2019
Hollins Center Plan	Roanoke County	2021
Oak Grove Plan	Roanoke County	2021
Hollins Area Plan	Roanoke County	2008
Glenvar Community Plan	Roanoke County	2012
Roanoke County Community Strategic Plan	Roanoke County	2016
Roanoke County Comprehensive Plan	Roanoke County	2005
419 Town Center Plan	Roanoke County	2019
Explore Park Adventure Plan	Roanoke County, Bedford County	2016
Vinton Area Corridors Plan	Vinton	2010
Vinton Comprehensive Plan	Vinton	2004
Vinton Urban Development Areas	Vinton	2016
City Plan 2040	Roanoke City	2020
Senior Quality of Life Survey	Roanoke City	2018
City of Roanoke Downtown Plan	Roanoke City	2017
Downtown Intermodal Study	Roanoke City	2015
Age Friendly Community AARP Survey	Roanoke City	2019
Melrose Avenue Bus Stop Improvement	Roanoke City	2016
Exit 150 Market Study	Botetourt	2015
Botetourt Comprehensive Plan	Botetourt	2017
Gateway Crossing Area Plan	Botetourt	2016
Salem Downtown Plan	Salem	2016
Salem Comprehensive Plan	Salem	2015
Vision 2040: Roanoke Valley Transportation Plan	Regional	2017
Community Health Assessment	Regional	2018
I-81 Corridor Improvement Plan	Regional	2018
81 & 581 Auxiliary Lane Study	Regional	2016
Route 11/460 Corridor Study	Regional	2013
Route 419 Corridor Study	Regional	2010
Route 460 Operational Improvement Study	Regional	In progress
Bus Stop Accessibility Study	Regional	2013
RADAR Transit Development Plan	Regional	2018
Valley Metro Transit Development Plan	Regional	2018

Plan	Locality	Year
Valley Metro Comprehensive Operations Analysis	Regional	2018
Regional Transit Vision Plan	Regional	2016
Coordinated Human Services Mobility Plan	Regional	2013
Roanoke Valley Greenways Plan	Regional	2018
Regional Bikeway Plan	Regional	2012
Regional Pedestrian Vision Plan	Regional	2015
Traffic Congestion Management Process	Regional	2020
Roanoke Valley Regional Transportation Safety Study	Regional	2019
2019 Travel Demand Model	Regional	2021

Appendix B – Template for Aligning Needs, Solutions, and Objectives

Table 2: Phase I Deliverable – Table Aligning Need Categories, Common Solutions, and Regional Objectives

Need Category	Common Solutions	Objective
System Management (Assets)	Improve/replace existing bridge(s)	Maintain state of good repair.
Congestion	Add New Through Lane(s)	Reduce traffic congestion on primary travel corridors within the region.
Safety (Ped)	Improve Bike/Pedestrian Crossing (At Grade)	Reduce the number and rate of non-motorized fatalities and serious injuries.
Safety (Bike)	Add/Construct Bike Lane	Reduce the number and rate of non-motorized fatalities and serious injuries.
Safety (Auto)	Rumble Strip Installation	Provide a safe and secure environment for the traveling public.
Access (All Modes)	Develop properties to be multimodal-accessible	Provide safe, reliable, and affordable connections to employment, education, healthcare, and other essential services.

Note: This table is populated with example needs, possible common transportation solutions, and objectives.

Appendix C – Illustration of Common Solutions Derived from TIP

Table 3 illustrates how draft common solutions derived from the FY 2021 to 2024 Transportation Improvement Program (TIP). Common solutions are derived primarily by examining the project name and description to deduce the work that has been completed with as much precision about the type of work as possible. Some project names and descriptions are not detailed enough about the type of work completed to permit for a detailed solution to be identified. When the project name and description do not specify the project details, the common solution will need to be derived from other sources described in step 1.

Table 3: Example Solutions Derived from FY 2021 to 2024 TIP

UPC	Project Name	Description	Solution Category	Common Solution
107061	Rte. 419 Safety Improvements at Tanglewood	From: 0.45 Mile South of Int. of Route 11 & Route 117 To: Int. of Route 11 & Route 117 (2017 HB2/SMART SCALE project)	Safety Countermeasures	<i>Not specified</i>
116203	#I-81 - MM136 to MM139 adding lane in each direction	From: I-81 Exit 137 Interchange To: Red Ln. Overpass	Highway Capacity Expansion	Add New Through Lane(s)
113173	I-81 Exit 137 SB Safety Improvements	From: Beginning of I-81 Exit 137 SB Off-Ramp To: End of I-81 Exit 137 SB Off-Ramp	Safety Countermeasures	<i>Not specified</i>
108906	I-81 NB Auxiliary Lane from Exit 141 to 143	Add one lane on I-81 NB - From: 0.026 Mi. West of Int. SBL I-81 Entrance Ramp To: I-81 (2017 HB2/SMART SCALE project)	Highway Capacity Expansion	Auxiliary Lanes
119462	Route 419 Streetscape Improvements, Phase 2	Improvements between Ogden & Starkey Rds. include converting north and south shoulders to shared through/right turn lanes, sidewalks and bicycle lanes on the north and south sides, and pedestrian signals w/crosswalks at the Starkey Rd. intersection.	Pedestrian Improvements (Sidewalks) Pedestrian Improvements Bicycle Improvements Intersection Improvements	Construct Sidewalk Improve Bike/Pedestrian Crossing (At Grade) Add/Construct Bike Lane Turn Lane Improvements

Source: Projects extracted from the fiscal year (FY) 2021-2024 Transportation Improvement Program (TIP). Retrieved from <https://rvarc.org/wp-content/uploads/2021/08/FY21-24TIP-083121.pdf>.

Appendix D – Project Features Used in SMART SCALE

Figure 2: Screenshot Showing Project Features Used in SMART SCALE

E.2 Process Improvements

Tiering based on features selected

- Tier 1 = 30 ft
- Tier 2 = 1/8 mile
- Tier 3 = 1/4 miles

Project Feature	E.2 Tier
Access Management	1
Add/Construct Bike Lane	1
Bike/Pedestrian Other	1
Construct or Convert Existing General Purpose or Parking Lane to Bus-only Lane	1
Construct or Improve Bus Stop / Shelter	1
Construct Shared-Use Path	1
Construct Sidewalk	1
Improve Bike/Pedestrian Crossing (At Grade)	1
Improve Bike/Pedestrian Crossing (Grade Separated)	1
Improve Grade-Separated Interchange	1
Improve Rail Crossing	1
Increase Existing Route Service – Addtl Vehicles or Increased Frequency	1
Innovative Intersection(s) / Roundabout(s)	1
Intercity Passenger Rail Service Improvements	1
Intersection Improvement(s)	1
ITS Improvement(s) / Adaptive Signal Control	1
New Intersection	1
New Route/Service	1
New Traffic Signal	1
New/Expanded Vanpool or On-Demand Transit Service	1
Other Transit Technology Improvements	1
Rail Service Improvements	1
Ramp Improvement(s)	1

Project Feature	E.2 Tier
Road Diet	1
Roadway Reconstruction/Realignment	1
Shoulder Improvement(s)	1
TDM Other	1
Traffic Signal Modification	1
Turn Lane Improvement(s)	1
Widen Existing Lane(s) (No New Lanes)	1
Construct/Expand Bus Facility	2
Freight Rail improvements	2
Improve Park and Ride Lot	2
New Intercity Passenger Rail Station or Station Improvements	2
New Park and Ride Lot	2
New Station or Station Improvements	2
Right-of-Way/Easements acquisition required	2
Add New Through Lanes(s)	3
Highway Other	3
Improve/replace existing bridge(s)	3
Managed Lane(s) (HOV/HOT/Shoulder)	3
New Bridge	3
New Interchange, Limited Access Facility	3
New Interchange, Non-Limited Access Facility	3
Rail Transit Other	3
Roadway on New Alignment	3



Source: Office of Intermodal Planning and Investment (2021). SMART SCALE. Presentation by Brooke Jackson to the RRTPO Technical Advisory Committee. November 8, 2021. Retrieved from <https://youtu.be/p1QJMby966E?t=2840>.

Appendix E: Future Factors

Theme 1: Technology	Theme 2: Society	Theme 3: Economy	Theme 4: Sustainability	Theme 5: Funding & Finance
Connected & Automated Vehicles (CAV)	Aging Society	Labor Force	Climate Change	Revenue Sources
Drone / Automated Vehicle deliveries	Equity	Job Types and Skills	Electrification	Pricing
Broadband	Increased Reliance on Remote Services	High-Tech Startups and Entrepreneurial Regional	Alternative Energy	Costs
On-Demand Transit	Transportation Impact of the COVID-19 pandemic	Fewer “Brick and Mortar” Retailers	Natural Resources	
Mobility as a Service		Tourism	Alternatives to Single Occupant Vehicles	

Source: Roanoke Valley Transportation Planning Organization (RVTPO). *Roanoke Valley Transportation Plan – Future Factors*. July 28, 2021.

Appendix F – Template for Potential Solutions

Table 4 provides a template for aligning potential solutions with gap needs. The need IDs are unique identifiers that can be created to match the table with a spatial file showing each needs' location in a geographic information system (GIS)-compatible format. All the potential solutions are listed as columns in this table, allowing for a check mark or 'X' to indicate when a solution may be applied to a given need.

Table 4: Phase II Deliverable – Potential Solutions Assigned to Prioritized Needs by Need Category

Need ID	Simple Location	Detailed Location	Need	Need Priority	Solution #1	Solution #2	Solution #3	Solutions Summary
1					x		x	Solution 1, Solution 3
2								
3								
4								
5								
6								

Appendix G – Example Solutions Evaluation Template

Instructions:

- Fill in goal weights.
- Fill in efficacy criterion with rating for each objective that is relevant to the solution.
- Fill in the potential to generate unintended needs criterion for each goal area where a solution may generate an unintended need.

Goal Weights	Goal	Objective	Efficacy Criterion	Potential to Generate Unintended Needs Criterion
	Goal 1: Provide a safe and secure transportation system	a. Eliminate fatalities and reduce injuries on the multimodal transportation system.		
	Goal 2: Enable reliable mobility	a. Maintain vehicle travel time reliability on priority corridors.		
		b. Maintain transit and passenger rail on-time performance (OTP).		
	Goal 3: Enable convenient and affordable access to destinations	a. Provide motorized access to inaccessible properties identified for future development.		
		b. Increase accessibility to key destinations by transit.		
		c. Increase transportation connections to markets outside the region, including across Virginia and the U.S.		
		d. Increase transit, bicycle and pedestrian connections for all users within multimodal centers and districts.		
	Goal 4: Foster environmental sustainability	a. Minimize emissions from motorized on-road transportation.		
		b. Minimize / mitigate new impervious surfaces created by transportation infrastructure.		
	Goal 5: Maintain and operate an efficient and resilient transportation system	a. Maintain state and national standards for infrastructure and asset condition.		
	Goal 6: Support economic vitality	a. Ensure redevelopment and new developments in designated growth areas and multimodal centers/districts are supported by more than one mode of transportation infrastructure.		
		b. Maintain truck travel time reliability.		

Goal Weights	Goal	Objective	Efficacy Criterion	Potential to Generate Unintended Needs Criterion
		c. Maintain acceptable levels of congestion during peak travel periods on priority corridors.		
	Goal 7: Promote equitable transportation investments	a. Assess planning-level benefits or disproportionate adverse effects of transportation projects included in this plan on Equity Emphasis Areas and identify mitigation strategies.		
		b. Ensure that non-drive alone mobility investments create opportunities for people in Equity Emphasis Areas.		
		c. Eliminate fatalities and reduce serious injuries in Equity Emphasis Areas.		
		d. Maintain state and national standards for infrastructure condition in Equity Emphasis Areas.		
100%	TOTAL			

Source: Roanoke Valley Transportation Planning Organization (2022). TTC Special-Called Meeting, Staff Report. January 5, 2022. Pages 17-21. Retrieved from <https://rvarc.org/wp-content/uploads/2022/01/RVTP-Staff-Report-2.pdf>.

Appendix H – Development of Decision Guidelines

Decision guidelines can filter solutions before scoring them along criteria by assessing their viability for resolving a particular need. Solutions that are not viable to resolve a given need based on the sites' characteristics can be excluded from later evaluation. Developing decision guidelines is intended to save the staff time by filtering solutions through research- or practice-informed network or performance criteria and to ensure that only solutions that are viable based on the sites' characteristics are selected as a preferred solution to a given need.

Decision guidelines are derived from existing and accepted tools and regulations insofar as possible (primarily be for infrastructure solutions). When these tools and regulations are inadequate, planning and infrastructure staff at the VDOT Salem district office, RVTPO staff, and planning and engineering experts in peer regions can be interviewed to identify appropriate guidance for applying each solution. Finally, the RVTPO staff's and consultant team's planning and engineering judgment—informed by research—provide the final source for the decision guidance.

The decision guidance is manually formed into a 'decision tree' for each needs category that says when a certain solution is the appropriate based on sequentially examined criteria. A decision tree is composed of a set of hierarchical criteria for which the answers progressively lead to one or more viable solutions to the need. There are generally two decision trees for each needs category: one for infrastructure solutions and another for policy solutions (both transportation and non-transportation). One decision tree may refer the user to another decision tree, such as when a non-recurring congestion problem may have an operational or a safety solution. Decision trees can be created by hand or in any software such as MS PowerPoint that allows for the criteria and connections among criteria depending on the answers to be inserted. Figure 3 and Figure 4 show example decision trees.

Figure 3: Example Decision Tree for Congestion Needs

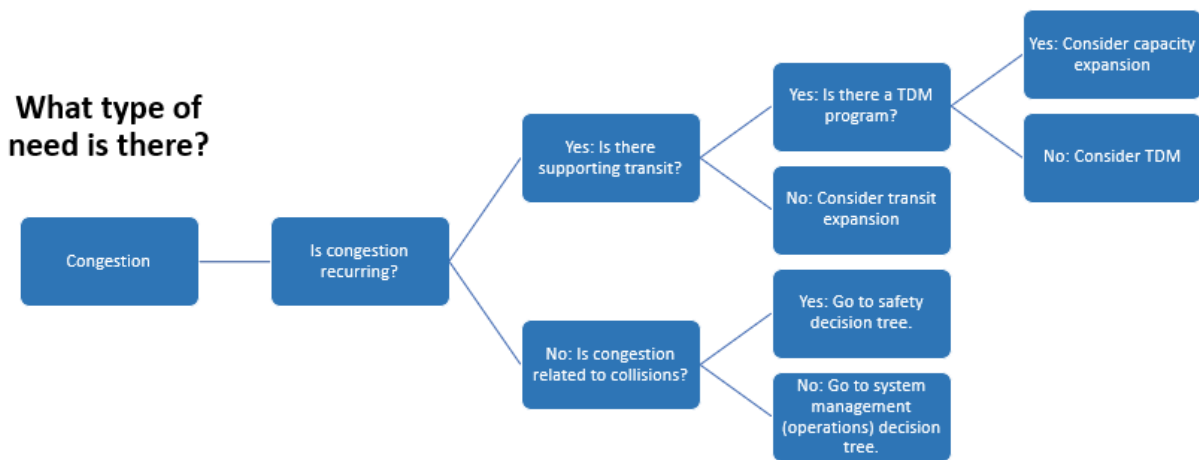
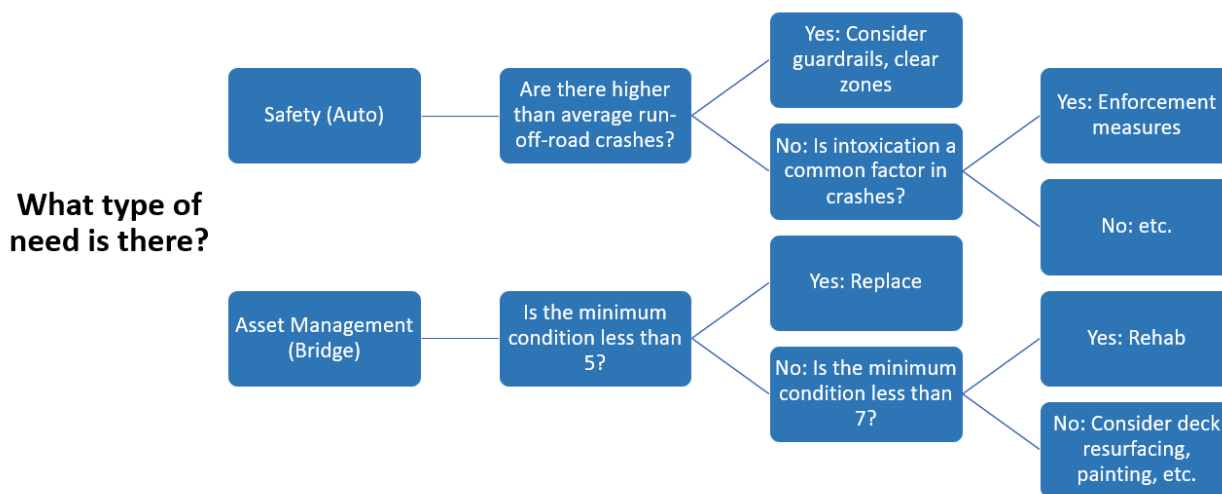


Figure 4: Example Decision Trees for Safety and Bridge Asset Management Needs



The most important part of constructing a decision tree is identification of the proper criteria and the actions taken depending on the answer to the criteria. It is recommended to constitute these criteria through the following sequential steps.

- a. **Existing tools and regulations:** Examine tools and regulations with embedded decision trees or prioritization guidance. These may be found in documentation for MPO or state solution selection processes. A list of already identified tools is in Table 5, along with the data inputs that are needed. The list of tools in Table 5 is not exhaustive but rather shows the tools that are likely most appropriate for use based on widespread acceptance (in Virginia when possible or nationwide otherwise), their low cost or lack of cost, and their close alignment with the need categories.

Table 5: Sample of Tools and Regulations with Decision Trees and Decision Guidance (Primarily for Infrastructure Solutions)

Needs Category	Tool(s) or Research that are Sources for Decision Trees	Inputs
Safety (auto)	Safety Performance for Intersection Control Evaluation (SPICE) Tool	Intersection Type, Analysis Year, Opening Year, Design Year, Facility Type, Facility Secondary Type (For Roundabouts Only), Number of Legs, Opening Year – Major Road AADT, Opening Year – Minor Road AADT, Number of Approaches with Left-Turn Lanes, Number of Approaches with Right-Turn Lanes, Number of Uncontrolled Approaches with Left-Turn Lanes, Number of Uncontrolled Approaches with Right-Turn Lanes + A group of optional inputs for calibration
Safety (ped)	PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System	Performance objective, Crash type of interest (ex: bus-related, turning vehicle, dart/dash, etc.), Area type (rural/urban), Road functional class, ADT, Speed limit, Number of through lanes, Traffic signal presence (with an indication of whether addition/removal is an option), Location description (intersection/midblock), Special location features (transit route, school zone, work zone, railroad crossing)

Needs Category	Tool(s) or Research that are Sources for Decision Trees	Inputs
Safety (bike)	BIKESAFE: Bicycle Countermeasure Selection System	Performance objective, Crash type of interest (ex: bus-related, turning vehicle, dart/dash, etc.), Area type (rural/urban), Road functional class, ADT, Speed limit, Number of through lanes, Traffic signal presence (with an indication of whether addition/removal is an option), Location description (intersection/midblock), Location description (on-road/off-road), On-road bike facility type
Safety (transit)	PEDSAFE has some transit-related safety countermeasure [Transit Stop Improvements, Access to Transit, Bus Bulb Outs]	Performance objective, Crash type of interest (ex: bus-related, turning vehicle, dart/dash, etc.), Area type (rural/urban), Road functional class, ADT, Speed limit, Number of through lanes, Traffic signal presence (with an indication of whether addition/removal is an option), Location description (intersection/midblock), Special location features (transit route, school zone, work zone, railroad crossing)
Congestion	Capacity Analysis for Planning of Junctions (CAP-X) Tool	Number of legs at the intersection, number of lanes for each movement in each leg, Major street direction, turning movements volumes, Adjustment factors for turning movements, percentage of heavy trucks per leg, Volume growth percentage by leg, Truck to PCE factor, Multimodal activity level, Critical lane volume sum limits, Number of ped crossings at the intersection, Number of lanes crossed by ped for each crossing, Vehicle speed at the crossing, Number of bicycle crossing segments at the intersection, Number of segments per intersection, Type of bike lane by segment, Vehicle speed
	VDOT Junction Screening Tool – VJuST	Number of through lanes for each leg, Turning movements volumes, Adjustment factors for turning movements, Percentage of heavy trucks per leg, Truck to PCE factor
System Management (operations, assets)	<i>None identified</i>	<i>Not available</i>
System Management (transit)	Transit Signal Priority Recommendation Tool	Dedicated Right-of-Way, Number of Lanes per Direction, Vertical Alignment, Bus Schedule Adherence, Transit Frequency, Number of Passengers, Transit Level of Service, the percent of buses operating in the corridor that have GPS/AVL, Bus Stop Placement, walk score, Transit-Dependent Population, Intersection Control Delay, Signal Control System, Signal Coordination
Access (all modes)	VDOT TransCAD Accessibility model	Point of interest and network data from HERE Technologies, transit networks based on General Transit Feed Specification (GTFS), and land use forecasts

To illustrate the tools' use with a hypothetical safety need, if a pedestrian safety need exists at a certain location, the PEDSAFE tool can be used to provide a list of appropriate countermeasures. The tool allows the user to answer a series of questions related to the location's geometric and operational characteristic, such as the number of through lanes and functional classification. The output of this tool is a list of countermeasures that can address the need, such as curb extension and pedestrian crossing island installation in the case of pedestrian safety needs.

- b. **Interviews:** Interview MPO and DOT staff about selection criteria that are not featured in documentation to fill in gaps. This step may be especially important for establishing viability of non-infrastructure and non-transportation policies and strategies.
- c. **Research-Informed Judgment:** Use research and engineering / planning judgement to fill gaps in the criteria left from the previous two sources. This will be especially important for new solutions that have not been implemented in the past and for non-infrastructure / non-transportation policies.

For policy solutions, supplemental research about each policy solution will be conducted to assess the circumstances in which it may be useful. Research can be found in examining sources that include the following list for studies that relate to the solution.

- i. TRB reports (including NCHRP, NCTRP, NCRRP, and NCFRP)
- ii. Academic articles found on Google Scholar or Microsoft Academic Search
- iii. Think tanks and research centers (e.g., Smart Growth America, Voorhees Transportation Center, Urban Institute)
- iv. Professional associations and advocacy groups (e.g., Institute of Transportation Engineers, American Planning Association, Association of Metropolitan Planning Organizations, Virginia Bicycling Federation, The League of American Bicyclists)
- v. Government Organizations (e.g., Vole Center)

After decision trees are formed for infrastructure and non-infrastructure transportation solutions under each needs category, they are applied to the needs resulting from phase II to identify one or more viable infrastructure and non-infrastructure solutions for each need.

Task 5:

PROCESS FOR IDENTIFYING AND PRIORITIZING PROJECTS

Project Development Process

The process for identifying and evaluating projects is intended to be implemented as part of the Roanoke Valley Transportation Plan (RVTP) after the identification and evaluation of solutions (Task 4). In this stage of the plan, all preferred solutions identified in the region will be translated into projects, which in turn will be categorized and ranked to determine which will be pursued for funding.

The process described in this task includes four major phases:

- **Phase I** refines every preferred solution identified in the previous task into a project or service.
- **Phase II** is a benefit evaluation. It is intended to measure the extent to which the benefits provided by a proposed project or service would advance the region's transportation goals and objectives and help meet performance measure targets.
- **Phase III** is a viability evaluation. This phase evaluates the high-benefit projects and services identified in Phase II and determines the extent to which they are ready to move into funding pursuit.
- **Phase IV** briefly considers the ways that the Roanoke Valley Transportation Planning Organization (RVTPO), localities, and other public agencies can use the prioritized project list to pursue funding for transportation improvements in the Roanoke Valley region.

Definitions of Terms

There are several terms that are important for understanding the proposed process. These terms are defined below.

Need – Transportation problem or issue identified in the community currently. As described in the Roanoke Valley Transportation Needs Assessment, a transportation need “states a problem, not a specific solution, and could be solved by multiple possible solutions.”¹

Gap Need – A need without a funded project or service.

Addressed Need – A need with a recently funded solution to be reviewed for performance outcomes prior to any further solutions identification, if needed.

Solution – An idea of how the region can achieve desired results. Solutions address specific transportation needs and contribute to the realization of a regional objective. Some transportation solutions may be simple enough to lead directly to a project whereas others may require further study/analysis.

Project – A specific scope of work describing how the solution will be implemented including start/end points, length, and cost.

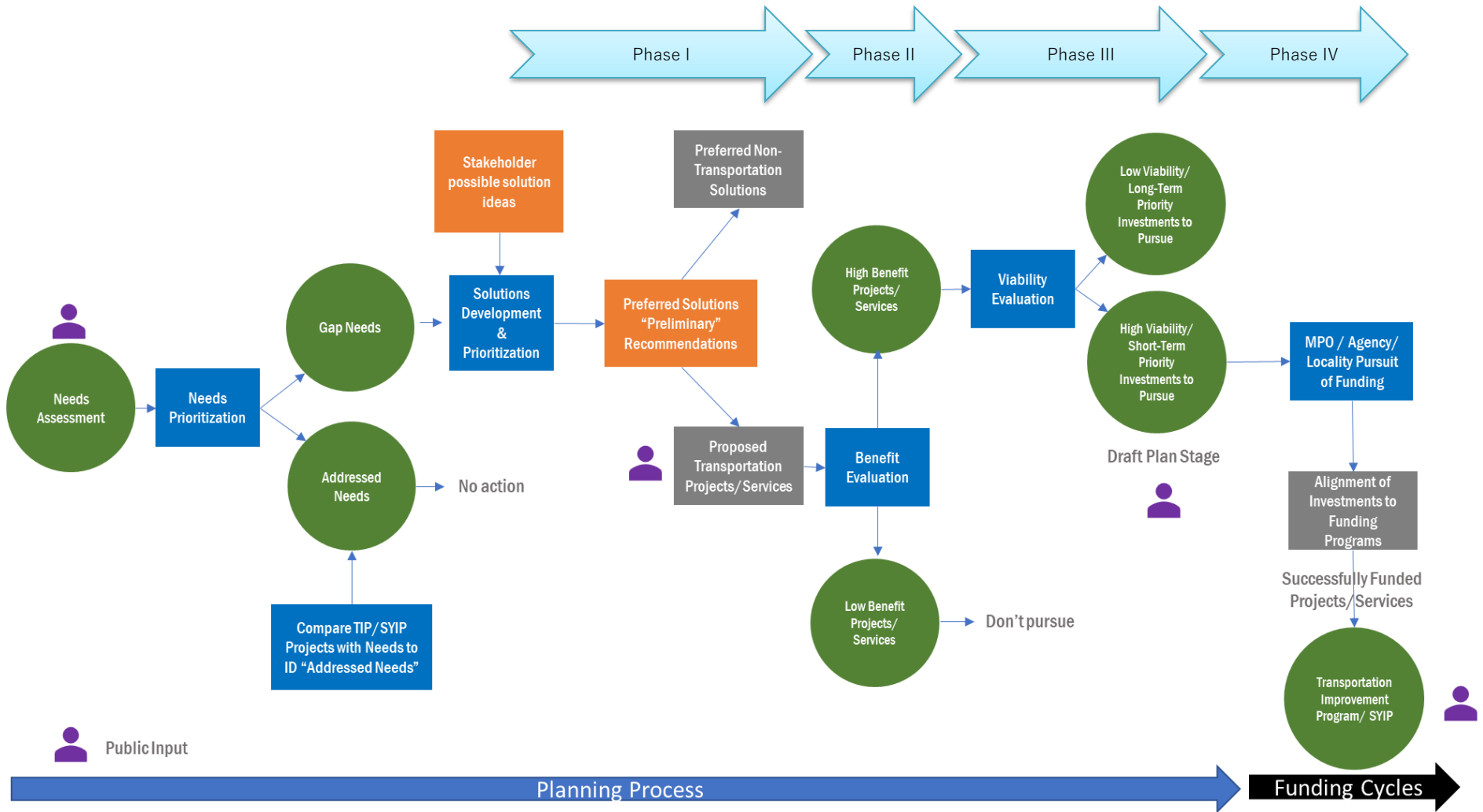
Study/Analysis – Additional work required to identify possible solutions or derive a project from a solution.

Common Solution – A transportation solution deriving from sources that are not related to the context of a particular need, such as past projects, peers, and best practices. It contrasts with unique solutions, which derive from a particular need's context.

Unique Solution – A solution deriving from the context of a particular need, in contrast to a common solution, which derives from past projects, peers, or best practices before being applied to a particular need. Unique solutions may be transportation or non-transportation solutions.

¹ RVTPO (2021). Roanoke Valley Transportation Needs Assessment. Approved April 22, 2021.

Figure 1: Project Identification and Prioritization Process Flow Chart



Phase I: Definition of Projects and Services

Phase I uses the preferred solutions for priority gap needs identified in Task 4 to develop a list of proposed transportation projects and services (Step 1). This list will be reviewed by stakeholders and the public, with amendments made as necessary (Step 2).

Phase I Inputs

The following inputs are needed for execution of Phase I:

- a) Complete List of Preferred Solutions

Phase I Deliverables

At the conclusion of Phase I, every preferred solution will be assigned a corresponding project or service that will be evaluated in later phases.

Step 1: Assemble List of Proposed Transportation Projects and Services

The final output of the Solutions Identification and Evaluation process (Task 4) was the assignment of a preferred solution to every gap need in the region. Figure 1 illustrates the process that was used to advance from RVTP's needs assessment to the identification of preferred solutions. This process is described in more detail in the Task 4 memo.

In Step 1 of this process, every preferred solution will be assigned a proposed project or service. Non-transportation solutions will be recommended to the appropriate agencies or services. The focus of the process described in this document, however, is the preferred solutions that evolve into a transportation project or service.

The transportation project or service can be defined based on a prior recommendation at that location, or as a newly proposed project. At a minimum, every proposed transportation project or service will be assigned a scope of work that identifies:

- Project Title
- The facility or service name
- The project location and limits or service element that is new or will be improved
- The project or service jurisdiction
- Description of need(s) being addressed and need type(s)
- The preferred solution(s) corresponding with the project or service
- A project category (i.e. Transit or Highway/Bicycle/Pedestrian)

- A general project or service description

The assigned need category should correspond to those defined by the RVTP's Needs Assessment and reflected in the Needs Evaluation and Solutions Tool (NEST).²

Step 2: Public Review of Proposed Projects and Services

After a project or service has been defined for each preferred solution in Step 1, the public and stakeholders will review the complete list of proposed transportation projects and services.

If a party reviewing the list would like to submit a new or additional project or service for consideration, the RVTP can enter the recommendation into the process as a Common or Unique Solution. This Solution will be evaluated and prioritized using the process described in the Task 4 memo. If the recommendation is determined to qualify as a preferred solution, it can then be translated into a project or service and added to the list of proposed projects and services.

Phase II: Benefit Evaluation

Phase II begins by establishing scoring thresholds that will be used to rate the benefits provided by each project or service in relation to the RVTP's goals, objectives, and performance measures (Step 3). The resulting scoring categories will be used to determine the benefit score of each project or service (Step 4), which in turn will be used to identify the region's high-benefit projects and services that will be advanced for further evaluation (Step 5).

Phase II Inputs

The following inputs are needed for execution of Phase II:

- a) Complete List of Projects and Services
- b) RVTP Goals, Objectives, and Performance Measures
- c) Goal and Objective Weights

Phase II Deliverables

At the conclusion of Phase II, every proposed transportation project or service will be assigned a benefit score. These scores will be used to select a sub-group of High Benefit Projects and Services that will be advanced for further evaluation.

Step 3: Establish Benefit Scoring Criteria

Every proposed project or service will be evaluated for its ability to generate benefits that advance the region's transportation goals and objectives, which are listed in Appendix A.

² RVTP Needs Evaluation and Solutions Tool:
<https://experience.arcgis.com/experience/7c2b2fb55b1b42c58954799c2156b922>

Benefit scoring criteria will utilize the performance measures that the RVTPO has selected for each of its objectives. It is important to note, however, that project or service benefits are not based on the existing conditions measured at a location. Benefits are instead based on the anticipated changes to each performance measure brought about by the project or service. For example, the safety benefit of a redesigned intersection would not be measured by the total number of crashes that occur at the intersection, but rather by the anticipated reduction in crashes that would occur at the intersection because of the new design.

For each performance measure, four scoring categories (0, 1, 2, or 3) will be established that capture the full range of potential impacts that a project or service could have on a performance measure. A project that provides no benefit to the objective's performance measure will receive a score of 0, while a project that provides the highest level of benefit will receive a score 3.

The first step in this phase, then, will be for the RVTPO to establish the measurement thresholds defining the benefit scores for each performance measure. Where performance measures have not yet been adopted related to an objective, a qualitative measure will be used.

*Figure 2: Sample Benefit Scoring Criteria
(For Illustrative Purpose Only)*

Objective 1A: Eliminate fatalities and reduce injuries on the multimodal transportation system.	
Performance Measure: Number of motorized fatalities per 100 million vehicle miles traveled.	
Benefit Score	Anticipated Change in Performance Measure
No Benefit (0 Points)	No Reduction/ Anticipated Increase in Motorized Fatalities
Low Benefit (1 Point)	Reduction of 0-1 fatalities per 100 million VMT
Medium Benefit (2 points)	Reduction of 1-3 fatalities per 100 million VMT
High Benefit (3 Points)	Reduction of 3 or more fatalities per 100 million VMT

The criteria used in the scoring of each objective could be derived quantitatively based on a project or service's potential impact on the objectives' performance measure, or it can be based on planning or engineering judgment supported by research. Appendix B offers examples of benefit scoring measures and criteria. These would need

to be adapted to correspond directly with the performance measures selected by the RVTPO but are intended offer instructive ideas and guidance for measuring project benefits.

Step 4: Calculate Benefit Scores

The following steps should be followed for each project or service to calculate a benefit score:

- 1) Assign the project or service a score for each objective from 0 (No Benefit) to 3 (High Benefit) for its ability to advance the objective.
- 2) Sum the scores within each goal area and divide by the maximum score possible, which is the product of 3 by the number of objectives within the goal.
- 3) Weight the goal-level score by goal weights. This can be done by multiplying the output for the previous step by the goal weight. Utilize the same goal weights that were determined in the Solutions Development process of Task 4.
- 4) Sum the result of the previous step across the RVTPO goals to produce a benefit score.

Step 5: Establish High Benefit Threshold

Once benefit scores have been calculated for every proposed project or service, RVTPO staff or consultants should receive input from the TTC members for guidance on a preferred threshold for "high benefit" projects and services based on the calculated benefit scores.

The high benefit threshold can be defined in multiple ways. One approach is to establish a score that a project or service must equal or exceed to be considered "high benefit."

Alternatively, the RVTPO could choose to select a particular number of the highest scoring projects (overall, by locality, or within each project category) to be designated as high benefit projects.

Only projects and services that are categorized as "high benefit" will advance to Phase III for viability evaluation.

Phase III: Viability Evaluation

Phase III evaluates the viability of the high benefit projects or services identified in Phase I to determine which are the best candidates to submit for funding consideration. This phase begins with the selection of the criteria that will be used to evaluate the viability of each project or service (Step 6). These criteria will then be applied to all high benefit projects and services to separate them into high and low viability categories (Step 7). The results of this exercise will be used to create a draft RVTPO project list that will be reviewed by the TTC and Policy Board (Step 8) and then shared with the public

(Step 9).

Phase III Inputs

The following inputs support Phase III:

- a) Selected List of High Benefit Projects and Services
- b) Prior Transportation Studies and Plans
- c) Official Cost Estimates

Phase III Deliverable

Phase III produces the RVTP's draft project list, which will be divided between priority and vision projects and services. Once formally approved, this project list will be used in Phase III for the selection of projects and services that will be advanced for funding applications.

Step 6: Select Viability Evaluation Criteria

The initial step of Phase II will be the selection of the criteria that a project or service must satisfy to be considered a viable project or service. A "viable" project or service is one that has been studied and developed to the level of detail that is required for competitive funding applications.

Examples of Viability Criteria include:

- Project Readiness
- Availability of Detailed Cost Estimate
- Right of Way Sufficiency
- Likelihood of Local, State, or Federal Funding
- Implementation Timeframe
- Coordination with Other Projects
- Regional and Local Support

The RVTP staff can also select other viability criteria to respond to specific interests or concerns of the TTC or Policy Board.

Step 7: Determine Viability Ratings

After the project viability criteria are selected in Step 6, staff or consultants will apply the criteria to all high benefit projects and solutions identified in Phase II. Scoring can be performed using a binary yes/no outcome for every criteria, or with a graduated 0-3 point scale corresponding to Not Viable/Low Viability/Medium Viability/High Viability outcomes. Regardless of the scoring method, a total scoring threshold will then be established to separate "High Viability" projects and services from "Low Viability" projects and services.

Step 8: Review Project List with TTC and Policy Board

After the completion of Step 7, the RVTP staff will be able to create a draft RVTP project list.

"Low Viability" projects and services will be assigned to the RVTP Vision List. This list will include projects and services that are likely to generate a high level of benefit for the region but may need to be studied in greater detail

before they can be submitted for funding consideration.

"High Viability" projects and services will be included on the RVTP Priority List. Projects and Services on the Priority List can be ranked in order of Benefit Score to determine the order in which the projects or services should be pursued for funding. Alternatively, a cost/benefit score can be calculated for projects and services included on the Priority List using the benefit score calculated in Step 4 and detailed cost estimates. The RVTP can choose to rank the Priority List using this cost-benefit score to prioritize projects that offer the most benefit per dollar spent.

After this draft RVTP Project List has been created, it should be presented to the TTC and Policy Board for review.

Step 9: Present Draft Plan for Public Review

After the TTC and Policy Board have reviewed the Project List in Step 8, the draft project list will be presented to the public for review and comment.

Phase IV: Funding Acquisition

The final phase of the project identification and prioritization process involves the pursuit and acquisition of funding for the priority projects and services identified in Phase III. Projects and services are selected for funding applications in their priority ranking order (Step 10). Those projects and services that are successful in their respective grant programs and are slated to receive funding are then confirmed by the Policy Board through approval and inclusion in the region's Transportation Improvement Program (TIP). These projects and services are also reflected in the Commonwealth Transportation Board's Six-Year Improvement Program (SYIP) (Step 11).

Phase IV Inputs

Phase IV requires the following inputs:

- a) RVTP Priority List Projects and Services
- b) Funding Program Applications

Phase IV Deliverables

At the conclusion of Phase IV, the RVTP will receive the funding acceptance or denial decisions for projects and services that the RVTP and regional stakeholders have submitted for funding consideration.

Step 10: Submission of Projects and Services for Funding Consideration

Once it has been completed and approved, the RVTP and regional stakeholders will be able to refer to the priority list of projects and services to determine which projects or services should be selected for funding applications.

The overall order of priority should correspond with the

ranking of the project or services on the Priority List. In instances where funding is limited to specific kinds of projects only, the Priority List can be filtered according to the project category identified in Step 1. The top-ranking project or service within that project category can then be selected for the funding application.

Step 11: Addition of Successfully Funded Projects and Services to TIP/SYIP

Projects and services that the state chooses to fund will be considered by the Policy Board for inclusion in the region's Transportation Improvement Program and also reflected in the Six-Year Improvement Program. The RVTPO staff should closely track all submitted funding applications and present successful projects to the Policy Board, moving the project from the Roanoke Valley Transportation Plan to the Transportation Improvement Program.

Appendix A – RVTPO Goals and Objectives

Goals	Objectives
Goal 1: Provide a safe and secure transportation system	a. Eliminate fatalities and reduce injuries on the multimodal transportation system.
Goal 2: Enable reliable mobility	a. Maintain vehicle travel time reliability on priority corridors.
	b. Maintain transit and passenger rail on-time performance (OTP).
Goal 3: Enable convenient and affordable access to destinations	a. Provide motorized access to inaccessible properties identified for future development.
	b. Increase accessibility to key destinations by transit.
	c. Increase transportation connections to markets outside the region, including across Virginia and the U.S.
	d. Increase transit, bicycle, and pedestrian connections for all users within multimodal centers and districts.
Goal 4: Foster environmental sustainability	a. Minimize emissions from motorized on-road transportation.
	b. Minimize/mitigate new impervious surfaces created by transportation infrastructure.
Goal 5: Maintain and operate an efficient and resilient transportation system.	a. Maintain state and national standards for infrastructure and asset condition.
Goal 6: Support economic vitality	a. Ensure redevelopment and new developments in designated growth areas and multimodal centers/districts are supported by more than one mode of transportation infrastructure.
	b. Maintain truck travel time reliability.
	c. Maintain acceptable levels of congestion during peak travel periods on priority corridors.
Goal 7: Promote equitable transportation investments.	a. Assess planning-level benefits or disproportionate adverse effects of transportation projects included in this plan on Equity Emphasis Areas and identify mitigation strategies.
	b. Ensure that non-drive alone mobility investments create opportunities for people in Equity Emphasis Areas.
	c. Eliminate fatalities and reduce serious injuries in Equity Emphasis Areas.
	d. Maintain state and national standards for infrastructure condition in Equity Emphasis Areas.

Appendix B – Potential Benefit Evaluation Criteria

Goal	Objective	Candidate Measure	Measure Details	Likely Data Source
Goal 1: Provide a safe and secure transportation system	a. Eliminate fatalities and reduce injuries on the multimodal transportation system.	Expected Crash Reduction (EPDO) - Number	Anticipated crash prevention from the project	Virginia-approved Crash Modification Factors (CMFs), SMART SCALE Planning Level CMFs ³
		Expected Crash Reduction (EPDO) per Vehicle Miles Traveled (VMT)	Focuses on crashes per million miles rather than overall number of crashes. Allows for better comparison between projects on routes with different traffic volumes.	Virginia-approved Crash Modification Factors (CMFs), SMART SCALE Planning Level CMFs ⁴
Goal 2: Enable reliable mobility	a. Maintain vehicle travel time reliability on priority corridors.	Reduction in Person-Hours of Delay	Estimated peak hour travel time savings (peak volume, average occupancy)	SMART SCALE
		Improvement in auto travel speed in corridor	Compares no-build to build scenarios to determine project improvement.	SPS data, 2045 AADT Projections, E+C network modeling
		Decrease in number of person hours of delay	Projected travel time during analysis period minus the theoretical travel time at free-flow speed. Compare build vs no build scenarios.	Travel Demand Model, E+C Network Model
		Improvement in Travel Time Reliability	Statistically correlate LOTTR with TTI. Then use volume-delay function to estimate changes to TTI as a function of project changes to peak-hour traffic or capacity.	INRIX or NPMRDS
Goal 3: Enable convenient and affordable access to destinations	a. Provide motorized access to inaccessible properties identified for future development.	Improvement of access to otherwise inaccessible properties identified for future development	Can be binary (1 if yes, 0 if no), or categorized by number of properties affected	Future land development locations

³ OIPI (2022). SMART SCALE Planning Level CMFs. http://smartscale.org/documents/cmf-list-smart-scale-rd4_fy2022.pdf.

⁴ OIPI (2022). SMART SCALE Planning Level CMFs. http://smartscale.org/documents/cmf-list-smart-scale-rd4_fy2022.pdf.

Goal 3: Enable convenient and affordable access to destinations	b. Increase accessibility to key destinations by transit.	Level of improved access to Activity Centers	Using VTrans-defined activity centers	Interact VTrans
		Change in number of VTrans activity centers (or other destination type) served by transit.		Transit Stops posted on Interact VTrans ⁵ and transit agency GTFS feeds, ⁶ VTrans Activity Centers posted on Interact VTrans ⁷
Goal 3: Enable convenient and affordable access to destinations	c. Increase transportation connections to markets outside the region, including across Virginia and the U.S.	Does the project increase transportation connections to markets outside the region?	Binary yes/no response	<i>No additional data required</i>
Goal 3: Enable convenient and affordable access to destinations	d. Increase transit, bicycle, and pedestrian connections for all users within multimodal centers and districts.	Increase in Connections to Other Modes	Determine the number of other mode types (bus stops, train stations, sidewalks, trail, park & ride lots) that are within 1 mile [.5 mile/ .25 mile] of the project	GIS Analysis Bus stops ⁸ Train stations ⁹ Sidewalks ¹⁰ Park and ride lots ¹¹
Goal 4: Foster environmental sustainability	a. Minimize emissions from motorized on-road transportation.	Expected Emissions Reduction	Estimated reduction in GHG emissions and criteria pollutants from project	CMAQ emissions reduction estimation tool ¹² OR TDM output
Goal 4: Foster environmental sustainability	b. Minimize/mitigate new impervious surfaces created by transportation infrastructure.	Estimated amount or area of impervious surfaces created by project	Estimated based on facility type and project description	

⁵ OIPI (2022). Interact VTrans. Bus Stops. <https://vtrans.org/interactvtrans/map-explorer?layer=Bus%20Stops&field=Transit%20Provider¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

⁶ Trillium (n.d.). Virginia's GTFS Data. <http://virginia-gtfs.com/>.

⁷ OIPI (2022). Interact VTrans. Activity Centers. <https://vtrans.org/interactvtrans/map-explorer?layer=VTrans%20Activity%20Centers&field=Total%20Employment¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

⁸ OIPI (2022). Interact VTrans. Bus Stops. <https://vtrans.org/interactvtrans/map-explorer?layer=Bus%20Stops&field=Transit%20Provider¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

⁹ OIPI (2022). Interact VTrans. Passenger Rail Stations. <https://vtrans.org/interactvtrans/map-explorer?layer=Passenger%20Rail%20Stations&field=Service%20Provider¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

¹⁰ OIPI (2022). Interact VTrans. Sidewalks. <https://vtrans.org/interactvtrans/map-explorer?layer=Sidewalks&field=Default%20Symbology¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

¹¹ OIPI (2022). Interact VTrans. Park and Ride Lots. <https://vtrans.org/interactvtrans/map-explorer?layer=Park%20and%20Ride%20Lots&field=Transit%20Service%20Provided¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

¹² Federal Highway Administration (2022). CMAQ Emissions Calculator Toolkit. https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/.

Goal 5: Maintain and operate an efficient and resilient transportation system.	a. Maintain state and national standards for infrastructure and asset condition.	Does the project improve the condition of a bridge or a road that is currently in "poor" condition?		Road (pavement ¹³) /Bridge ¹⁴ Conditions
		Change in deck area-weighted average bridge condition (0-9 NBI scale) due to project		Likely requires bridge management system
		Change in lane mile-weighted average pavement condition due to project		Likely requires pavement management system
Goal 6: Support economic vitality	a. Ensure redevelopment and new developments in designated growth areas and multimodal centers/districts are supported by more than one mode of transportation infrastructure.	Number of New Non-Work Destinations Accessible by Walking	Proximity calculation (buffer)/ network analysis for greater accuracy*Non-Work Destinations would need to be defined (hospitals, schools, community centers, retail businesses)	SMART SCALE/ GIS Analysis for areas without existing calculation
		Increase in average job access for all populations/travel modes	Increase in number of people with contiguous access to employment centers (access defined as within ten miles by auto; three miles by bicycle; one mile by walking or transit).	2045 horizon year total employment, existing & committed project (E+C) network model, bicycle or pedestrian system shapefiles
Goal 6: Support economic vitality	c. Maintain acceptable levels of congestion during peak travel periods on priority corridors	Change in number of hours with TTI over 1.25		Travel Demand Model, E+C network model

¹³ VDOT (n.d.). Pathways for Planning. <https://vdotp4p.com/>.

¹⁴ VDOT (2022). VDOT Bridges and Culverts. <https://www.virginiaroads.org/datasets/vdotbridgesculverts-ec/explore>.

Goal 7: Promote equitable transportation investments.	a. Assess planning-level benefits or disproportionate adverse effects of transportation projects included in this plan on Equity Emphasis Areas and identify mitigation strategies.	Does project adversely affect Equity Emphasis Area?	Adverse effects may include increases in congestion, pollution, noise, or crash risk.	Equity Emphasis Areas on Interact VTrans ¹⁵
Goal 7: Promote equitable transportation investments.	b. Ensure that non-drive alone mobility investments create opportunities for people in Equity Emphasis Areas.	Increase in average job access for residents in Equity Emphasis Areas	Increase in number of people living in Equity Emphasis Areas with contiguous access to employment centers (access defined as within ten miles by auto; three miles by bicycle; one mile by walking or transit).	2045 horizon year total employment, E+C network model, bicycle ¹⁶ or pedestrian system shapefiles, Equity Emphasis Areas on Interact VTrans ¹⁷
		Increase in average non-work destinations for residents in Equity Emphasis Areas	Increase in number of people living in Equity Emphasis Areas with contiguous access to non-work destinations (access defined as within ten miles by auto; three miles by bicycle; one mile by walking or transit).	Non-Work Destinations, E+C network model, bicycle ¹⁸ or pedestrian system shapefiles, Equity Emphasis Areas on Interact VTrans ¹⁹
Goal 7: Promote equitable transportation investments.	c. Eliminate fatalities and reduce serious injuries in Equity Emphasis Areas.	Expected Crash Reduction (EPDO) - Number, for projects in EEA	Anticipated crash prevention from the project	Virginia-approved Crash Modification Factors (CMFs), SMART SCALE Planning Level CMFs ²⁰
		Expected Crash Reduction (EPDO) per Vehicle Miles Traveled (VMT)- for project in EEA	Focuses on crashes per million miles rather than overall number of crashes. Allows for better comparison between projects on routes with different traffic volumes.	Virginia-approved Crash Modification Factors (CMFs),

¹⁵ OIPI (2022). Interact VTrans. Equity Emphasis Area (EEA) Index. [https://vtrans.org/interactvtrans/map-explorer?layer=Equity%20Emphasis%20Area%20\(EEA\)%20Index&field=Equity%20Emphasis%20Area%20Index¢er=-79.42091791156685%2C38.018031417766714&zoom=8](https://vtrans.org/interactvtrans/map-explorer?layer=Equity%20Emphasis%20Area%20(EEA)%20Index&field=Equity%20Emphasis%20Area%20Index¢er=-79.42091791156685%2C38.018031417766714&zoom=8).

¹⁶ OIPI (2022). Interact VTrans. Bicycle Facilities. <https://vtrans.org/interactvtrans/map-explorer?layer=Bicycle%20Facilities&field=VDOT%20Bicycle%20Facility%20Type¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

¹⁷ OIPI (2022). Interact VTrans. Equity Emphasis Area (EEA) Index. [https://vtrans.org/interactvtrans/map-explorer?layer=Equity%20Emphasis%20Area%20\(EEA\)%20Index&field=Equity%20Emphasis%20Area%20Index¢er=-79.42091791156685%2C38.018031417766714&zoom=8](https://vtrans.org/interactvtrans/map-explorer?layer=Equity%20Emphasis%20Area%20(EEA)%20Index&field=Equity%20Emphasis%20Area%20Index¢er=-79.42091791156685%2C38.018031417766714&zoom=8).

¹⁸ OIPI (2022). Interact VTrans. Bicycle Facilities. <https://vtrans.org/interactvtrans/map-explorer?layer=Bicycle%20Facilities&field=VDOT%20Bicycle%20Facility%20Type¢er=-79.42091791156685%2C38.018031417766714&zoom=8>.

¹⁹ OIPI (2022). Interact VTrans. Equity Emphasis Area (EEA) Index. [https://vtrans.org/interactvtrans/map-explorer?layer=Equity%20Emphasis%20Area%20\(EEA\)%20Index&field=Equity%20Emphasis%20Area%20Index¢er=-79.42091791156685%2C38.018031417766714&zoom=8](https://vtrans.org/interactvtrans/map-explorer?layer=Equity%20Emphasis%20Area%20(EEA)%20Index&field=Equity%20Emphasis%20Area%20Index¢er=-79.42091791156685%2C38.018031417766714&zoom=8).

²⁰ OIPI (2022). SMART SCALE Planning Level CMFs. http://smartscale.org/documents/cmf-list-smart-scale-rd4_fy2022.pdf.

				SMART SCALE Planning Level CMFs ²¹
Goal 7: Promote equitable transportation investments.	d. Maintain state and national standards for infrastructure condition in Equity Emphasis Areas.	Does the project improve the condition of a bridge or a road in an EEA that is currently in "poor" condition?		Road (pavement ²²) /Bridge ²³ Conditions
Goal 7: Promote equitable transportation investments.	d. Maintain state and national standards for infrastructure condition in Equity Emphasis Areas.	Change in deck area-weighted average bridge condition in an EEA (0-9 NBI scale) due to project		Likely requires bridge management system
		Change in lane mile-weighted average pavement condition for a corridor in an EEA due to project		Likely requires pavement management system

²¹ OIPI (2022). SMART SCALE Planning Level CMFs. http://smartscale.org/documents/cmf-list-smart-scale-rd4_fy2022.pdf.

²² VDOT (n.d.). Pathways for Planning. <https://vdotp4p.com/>.

²³ VDOT (2022). VDOT Bridges and Culverts. <https://www.virginiaroads.org/datasets/vdotbridgesculverts-ec/explore>.