

TPF-5(284) Near-Road Transportation Pooled Fund: December 2015 Update to the Five-Year Strategic Research Plan



Plan Prepared for

Washington State Department of Transportation
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STi
Sonoma Technology, Inc.
Environmental Science and Innovative Solutions



TPF-5(284) Near-Road Transportation Pooled Fund: December 2015 Update to the Five-Year Strategic Research Plan

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Contents

Figures	iv
Tables	iv
1. Introduction.....	1
2. Methods	3
3. Workshop Results	5
3.1 Potential Projects.....	5
3.1.1 Group A Potential Projects (High ranking).....	9
3.1.2 Group B Potential Projects (Medium ranking).....	11
3.1.3 Group C Potential Projects (Low ranking)	13
Appendix A. Near-Road Air Quality TPF Planning Workshop Materials	15
Appendix B. October 2014 Five-Year Strategic Research Plan [abbreviated version]	29

Figures

1. Voting results for potential future TPF projects.....9

Tables

1. Summary of potential TPF projects and associated proposed strategic goals.6

1. Introduction

In 2014, the Washington State Department of Transportation (WSDOT) and its state and federal agency partners created the Transportation Pooled Fund (TPF) to help agencies identify and address a broad range of near-road issues. Key motivators for the TPF include U.S. Environmental Protection Agency (EPA) requirements to quantitatively evaluate potential particulate matter (PM) hot-spots, EPA and U.S. Federal Highway Administration (FHWA) requirements to assess mobile source air toxics (MSATs), and recently implemented EPA requirements to monitor air quality near heavily traveled roads. As of December 2015, TPF participants include FHWA and five state Departments of Transportation (DOTs); Arizona, California, Texas, Virginia, and Washington. Sonoma Technology, Inc. (STI) was awarded a TPF support contract and is responsible for completing projects to meet TPF goals.

In June 2014, STI hosted a strategic planning meeting with representatives from each of the TPF partner agencies to identify, discuss, and prioritize goals and research projects. Key TPF goals identified by fund participants include:

1. Increase knowledge of the relationship between traffic conditions and monitored near-road air quality data
2. Improve best practices for project-level analyses
3. Increase knowledge of operational and construction mitigation measures that support near-road air quality improvements
4. Improve interagency exchange of information

TPF participants identified a number of projects related to these four goals, and ranked five of these projects as high priority. Following the meeting and with further input from the partners, STI developed a five-year strategic plan identifying the sequence and priority for completing the proposed projects to achieve TPF goals. Given the approximate costs of the high priority projects and the available budget, four projects were selected for the first phase of work. Work on these four high-priority projects commenced in October 2014 and final reports for the first phases of each project were delivered in spring and summer 2015. Work on the second phases of the projects began in September 2015.

In fall 2015, TPF participants and STI revisited the five-year strategic plan, brainstormed new potential project ideas to meet TPF goals and emerging needs, and re-prioritized future work. This document describes updates to potential project ideas and identifies the priority for completing the proposed projects to best meet participants' needs. The TPF partners anticipate continuing to update this plan from time to time to account for new scientific information, evolving regulatory requirements, lessons learned from completed work, and the changing needs of TPF partners and other stakeholders. Section 2 describes the process used by TPF participants and STI to identify and prioritize future work; this process included pre-workshop discussions and a one-day workshop. Section 3 discusses the results of the one-day workshop, including the prioritization of future

projects to achieve the goals of the TPF. [Appendix A](#) contains materials from the one-day workshop, including the agenda, draft potential projects, results from the voting process to prioritize projects, and photographs taken during the meeting. [Appendix B](#) contains an abbreviated version of the Five-Year Strategic Research Plan developed in October 2014 to guide the TPF partnership in developing and completing the first phase of near-road air quality research, analysis, and tool development projects under the fund.

2. Methods

To facilitate the creation of this updated strategic research plan, STI hosted a one-day workshop with representatives from the TPF partner agencies. The purpose of the workshop was to discuss research progress to date, review the October 2014 strategic research plan, and identify and prioritize future work—beyond currently funded projects—to meet the needs of the TPF partner agencies.

Prior to the workshop, STI contacted TPF participants to discuss priorities, challenges, and needs, and to solicit their ideas for future TPF projects. STI synthesized the interview results into 14 research topics with associated project ideas, and cross-referenced the ideas with TPF goals and with project ideas identified during the June 2014 strategic research planning meeting (see Appendix B).

The one-day workshop was held on October 28, 2015, at the STI office in Petaluma, California. Representatives from each of the TPF partner organizations participated, either in person or over the phone. The workshop consisted of PowerPoint presentations by STI staff, roundtable discussions, and voting on potential future projects (priority and cost range). In addition to the 14 priority projects identified prior to the meeting, several new project ideas were discussed. Vote totals were used to inform discussions, prioritize projects, and provide rough cost guidelines for consideration when scoping future projects. Voting was color-coded; state DOT/FHWA participants voted with red dots, and STI participants voted with green dots. Additional details about the workshop, including the agenda and a list of participants, can be found in Appendix A.

3. Workshop Results

3.1 Potential Projects

During the workshop, TPF partners discussed, ranked, and estimated approximate costs for future potential projects to meet TPF goals and the emerging needs identified during pre-workshop phone calls (see [Table 1](#) and [Figure 1](#)). Many of the projects discussed are related to projects identified during the June 2014 strategic planning meeting; however, several new topics were identified. A total of 17 different project ideas were discussed. The group discussed the importance of avoiding duplicating the work currently being conducted by others (e.g., the National Cooperative Highway Research Program [NCHRP], FHWA), and discussed that some of the projects overlap and could be combined into larger projects in the future, if funding permits. After the workshop, STI organized the potential projects into three groups based on priority rankings: high (A), medium (B), and low (C). The project ranked as highest priority during the October 2015 workshop—a modeling performance evaluation using near-road data—was the sole remaining unfunded high priority project among the five top priorities identified during the June 2014 meeting. During the workshop, participants identified that approximately \$1 million to \$1.5 million in additional funding would be needed to support completion of the six projects identified as high-priority.

Table 1. Summary of potential TPF projects and associated proposed strategic goals. A check mark (✓) indicates the primary goal of the project; a circle (●) indicates secondary goals also met by the project; a cross mark (x) indicates the anticipated project cost range. Results shown reflect outcomes from the October 2015 workshop.

Group	Rank	Related to 2014 Strategic Plan Project Idea?	Potential Projects <i>(and associated project number and title used to track discussion of and voting on the project during the October 2015 workshop)</i>	Strategic Goals				Cost Range ^a		
				Traffic and Monitored Data	Project-level Best Practices	Mitigation	Information Exchange	Below \$150K	\$150K to \$300K	Above \$300K
High (A)	1	✓	Evaluate air quality dispersion model performance by leveraging near-road measurement data (<i>Project #4: Modeling performance evaluation</i>)	●	✓		●			x
	2	✓	Assess PM mitigation options, with a focus on use of near-road barriers to reduce impacts on air quality (<i>Project #7: PM mitigation options</i>)	●		✓	●			x
	3	✓	Optimize use of non-Projects of Air Quality Concern (POAQC) findings (from completed/upcoming tasks) to reduce analysis work (<i>Project #1: Optimize use of TPF TO2</i>)		✓		●	x		
	4	✓	Assess and improve brake wear, tire wear, and re-entrained road dust analysis methods/assumptions (<i>Project #2: Brake and tire wear; re-entrained road dust</i>)		✓		●		x	
	5		Improve traffic data acquisition and use for analyses (<i>Project #13: Traffic data</i>)		✓		●	x		
	6	✓	Continue assessment of national near-road air quality (AQ) data (<i>Project #0: Continued assessment of near-road data</i>)	✓					x	

^a The cost range identified is approximate and is meant to provide a qualitative guide when scaling work scopes to available budgets.

Group	Rank	Related to 2014 Strategic Plan Project?	Potential Projects <i>(and associated project number and title used to track discussion of and voting on the project during the October 2015 workshop)</i>	Strategic Goals				Cost Range ^a			
				Traffic and Monitored Data	Project-level Best Practices	Mitigation	Information Exchange	Below \$150K	\$150K to \$300K	Above \$300K	
Medium (B)	7	✓	Anticipate PM _{2.5} National Ambient Air Quality Standards (NAAQS) changes and areas subject to PM hot-spots, evaluate mitigation options (<i>Project #3: Future changes to PM_{2.5} NAAQS</i>)			✓			X		
	8		Assess emerging technology (e.g., Intelligent Transportation Systems (ITS), truck chaining, self-driving autos) and their impacts on air quality (<i>Project #14: Emerging technologies</i>)			✓	●	X			
	9		Develop policy/technical approaches to minimize conformity work in new O ₃ nonattainment areas (<i>Project #10: New O₃ NAAQS</i>)		✓		●	X			
	10	✓	Organize/host near-road workshop and peer exchange forum (via existing strategic planning task) (<i>Project #16: Near-road workshop</i>)	●	●		✓	X			
	11	✓	Improve resource allocation for project-level analyses (<i>Project #6: Resource allocation</i>)		✓	●	●	X			
	12		Evaluate ultrafine PM, identify emerging issues (<i>Project #12: Ultrafine PM</i>)	✓						X	
	13	✓	Identify/refine best practices for project-level analysis (<i>Project #17: Best practices</i>)		✓		●			X	

^a The cost range identified is approximate and is meant to provide a qualitative guide when scaling work scopes to available budgets.

Group	Rank	Related to 2014 Strategic Plan Project?	Potential Projects <i>(and associated project number and title used to track discussion of and voting on the project during the October 2015 workshop)</i>	Strategic Goals				Cost Range ^a		
				Traffic and Monitored Data	Project-level Best Practices	Mitigation	Information Exchange	Below \$150K	\$150K to \$300K	Above \$300K
Low (C)	14	✓	Develop synthesis of DOT PM hot-spot experience <i>(Project #5: Synthesis of recent DOT experience)</i>		✓		●	x		
	15		Assist with Appendix W requirements to use AERMOD for CO hot-spot modeling <i>(Project #9: Transition for Appendix W requirements)</i>		✓		●		x	
	16		Evaluate and develop approaches to address updates to CEQ guidance on project-level greenhouse gas analysis <i>(Project #11: Updates to CEQ guidance)</i>		✓			x		
	17		Assess citizen monitoring and provide recommended approaches to evaluate/use data if collected by DOTs <i>(Project #15: Citizen monitoring)</i>	✓			●	x		

^a The cost range identified is approximate and is meant to provide a qualitative guide when scaling work scopes to available budgets.

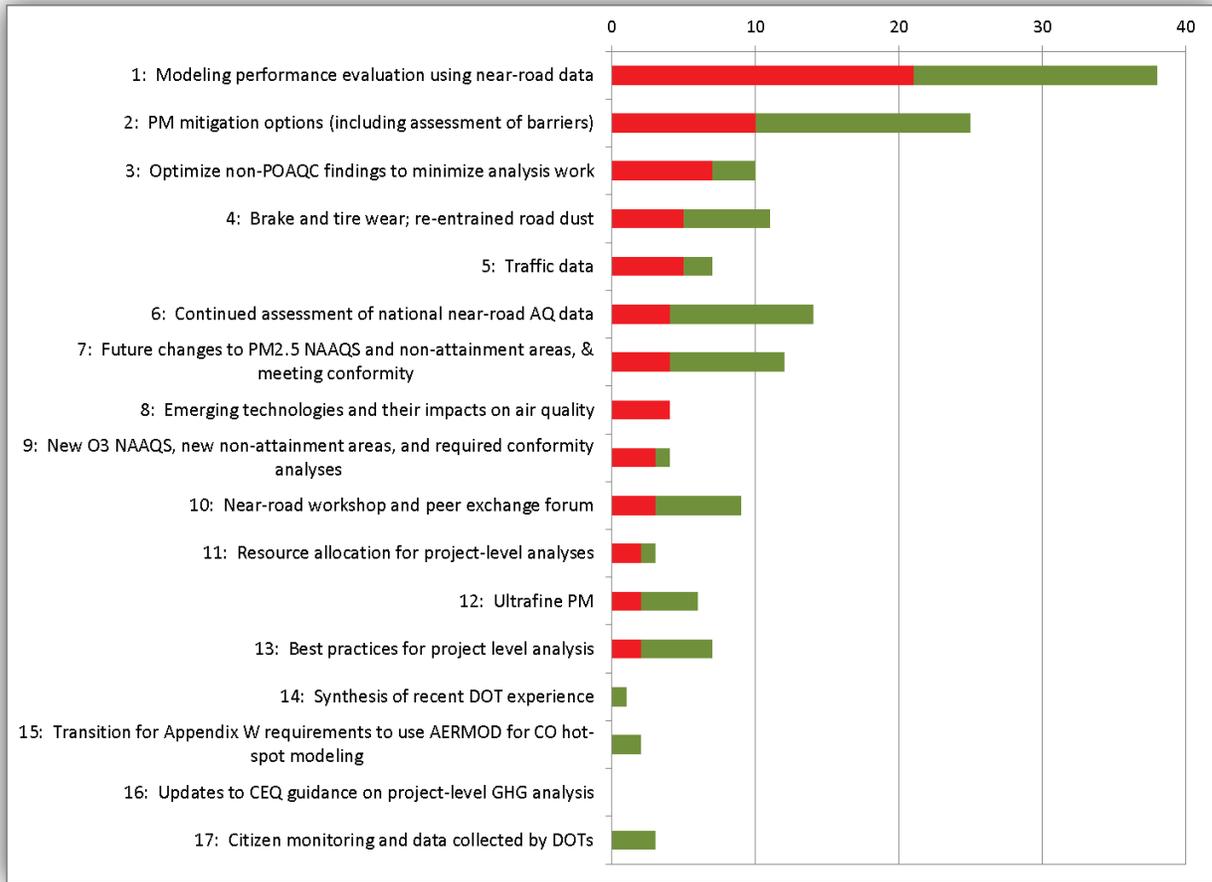


Figure 1. Voting results for potential future TPF projects. The red bars represent votes by DOT/FHWA fund participants, and green bars represent votes by STI participants.

The remainder of this section briefly describes each project, in priority order. Each project listing includes a short description of work elements and identifies the rough cost range anticipated to complete that effort.

3.1.1 Group A Potential Projects (High ranking)

1. *Evaluate air quality dispersion model performance by leveraging near-road measurement data (anticipated cost range: >\$300K).*
 - Review the 2007 National Research Council report “Models in Environmental Regulatory Decision Making,” and assess and summarize current state of practice for evaluating dispersion models.
 - Review revisions to Appendix W guidelines for air quality models and assess the implication on air quality modeling for DOTs.

- Develop a representative set of case studies that characterize different project and fleet situations (e.g., highway, intermodal facility, truck/freight corridors).
 - Collect, quality-assure, and process data from the national near-road monitoring network for the case studies.
 - Evaluate performance under different conditions by modeling selected case studies and comparing model predictions to near-road air quality measurements.
 - Develop recommendations for model improvement programs for consideration by the FHWA and the EPA.
 - Develop and deliver documentation and training.
2. *Assess PM mitigation options, with a focus on use of near-road barriers to reduce impacts on air quality (anticipated cost range: >\$300K).*
- Review literature to identify mitigation options.
 - Leverage mitigation work that is currently underway with Caltrans.
 - Explore the potential for utilizing regional-scale analyses that are already being done to demonstrate the air quality benefit of traffic flow improvements as project-level mitigation.
 - Develop compendium of mitigation options, including a review of the quantitative benefits of near-roadside barriers, structures, and terrain features, and other project-level mitigation options. Include a discussion of the conditions where different mitigation options are most useful.
 - Develop guidance on how the benefits of mitigation can be quantified (e.g., can the benefits be quantified using monitor data and/or AERMOD modeling?)
3. *Optimize use of non-POAQC findings (from completed/upcoming tasks) to reduce analysis work (anticipated cost range: <\$150K).*
- Document results of WSDOT's work and efforts by others to use findings from TPF Task Order 2: "Exploratory scoping study to identify potential project types and situations that will not create PM hot spots or are not a project of air quality concern" to engage in interagency consultation and minimize analysis work. Relate findings to small projects with limited traffic information that are categorically excluded from the National Environmental Policy Act (NEPA) analysis.
4. *Assess and improve brake wear, tire wear, and re-entrained road dust analysis methods/assumptions (anticipated cost range: \$150K–\$300K).*
- Leverage and expand upon work currently underway with Caltrans, including
 - Compare brake wear and tire wear in EMFAC and MOVES
 - Review literature and quantify brake wear/tire wear impact on PM emissions
 - Evaluate advanced vehicle penetration and develop adjusted future brake/tire wear
 - Evaluate AP-42 and ARB's road dust emissions modeling approaches and parameters

- Identify alternatives to AP-42 for modeling re-entrained road dust.
 - Resolve differences between brake and tire wear and re-entrained road dust in the MOVES and EMFAC models.¹
5. *Improve traffic data acquisition and use for analyses (anticipated cost range: <\$150K).*
- Document how states are currently obtaining and processing traffic data, what tools are being used to integrate traffic data into an emissions model, and resource allocation information.
 - Supplement pending NCHRP 25-25/Task 96 guidance on traffic data needed to complete air quality analyses (avoid duplication of any work that is planned or underway).
6. *Continue assessment of national near-road AQ data (anticipated cost range: \$150K–\$300K).*
- Provide periodic updates and near-road assessment findings as new near-road monitoring data become available (e.g., every six months).
 - Provide periodic updates to the graphical display of near-road assessment findings on the pooled fund website.
 - Identify methods and criteria that explain high-concentration events in near-road pollutants; develop illustrative case studies.
 - Track relevant near-road literature, project assessment findings, tool development, guidance, and other resources; provide periodic summaries of important insights.

3.1.2 Group B Potential Projects (Medium ranking)

7. *Anticipate PM_{2.5} NAAQS changes and areas subject to PM hot-spots, evaluate mitigation options (anticipated cost range: \$150K–\$300K).*
- Identify mitigation options (e.g. relocate and reduce).
 - Set up multiple model scenarios to evaluate the impacts of mitigation options.
8. *Assess emerging technology (e.g., ITS, truck chaining, self-driving autos) and their impacts on air quality (anticipated cost range: <\$150K).*
- Review the literature on and assess the benefits of traffic improvement technology on PM emissions (e.g., ITS, signaling, truck chaining, connected vehicles).
9. *Develop policy/technical approaches to minimize conformity work in new O₃ nonattainment areas (anticipated cost range: <\$150K).*
- Develop guidance on how to perform NO_x and volatile organic compounds (VOC) analyses.

¹ Following the October 2015 workshop, the EPA released a new version of the MOVES model, MOVES2014a, which increased the disparity between MOVES and EMFAC brake wear emissions estimates.

- Evaluate options for areas located on the edge of a non-attainment area (that will likely be in attainment by 2025) for avoiding the need to perform conformity analyses.

10. *Organize/host near-road workshop and peer exchange forum (via existing strategic planning task) (anticipated cost range: <\$150K).*

- Organize and host a near-road information exchange workshop for pooled fund partners and other invited attendees that includes a forum and covers:
 - Relevant issues for project analyses (including POAQC best practices)
 - Conformity policy issues (emerging and resolved)
 - Changes to Appendix W
 - Citizen monitoring
- The workshop may be organized in association with the American Association of State Highway and Transportation Officials (AASHTO) and/or the Transportation Research Board (TRB).
- Prepare a post-workshop summary and related information to attendees.
- Complete this work, with additional funding support, as part of the existing strategic planning task order.

11. *Improve resource allocation for project-level analyses (anticipated cost range: <\$150K).*

- Perform a literature review of relevant sensitivity studies for travel demand, emissions, and dispersion modeling for PM hot spot analyses.
- Identify practical modeling lessons by obtaining feedback from key practitioners.
- Document steps in the analysis chain on which project analysts should spend the most resources (time/budget) to best characterize their project (e.g., replacing model defaults with local data, refining travel speeds, quality-assuring model inputs and assumptions).
- Illustrate the relative importance of the analysis steps (identified above) using a hypothetical project.
- Develop and deliver documentation and training resources.

12. *Evaluate ultrafine PM, identify emerging issues (anticipated cost range: \$150K–\$300K).*

- Evaluate how ultrafine PM emissions/concentrations vary as a function of traffic conditions (e.g., speed).
- Assess trends in ultrafine PM emissions and near-road impacts.

13. *Identify/refine best practices for project-level analysis (anticipated cost range: \$150K–\$300K).*

- Document best-practices for future project-level analyses with the focus being what agencies should be doing as opposed to a retrospective analysis of what they have been doing.
- Leverage work recently completed for Caltrans that focused on PM analysis, but expand to cover all near-road pollutant topics.

3.1.3 Group C Potential Projects (Low ranking)

14. *Develop synthesis of DOT PM hot-spot experience (anticipated cost range: <\$150K).*

- Identify modeling tools and areas of largest impact on resources (time/budget) by obtaining feedback from DOT staff about their experience with recent project-level analyses. The interview could include the following questions:
 - What tools do you use to acquire and process traffic and meteorological data?
 - Where do you obtain the traffic and meteorological data?
 - What tools do you use, and how do you use them, to integrate (a) traffic data into your emissions model, and (b) emissions model output into your dispersion model?
 - What tools do you use, and how do you use them, to post-process dispersion model outputs and calculate design values?
 - What areas in the project-level analysis are most complicated or take the most resources (time/budget)?
 - In what areas do you need additional resources/training/tools?
- Obtain and assess tools for their ease of use and transferability to other states.
- Identify tool development needs.

15. *Assist with Appendix W requirements to use AERMOD for CO hot-spot modeling (anticipated cost range: \$150K–\$300K).*

- Develop guidance for streamlining project-level CO analyses (taking care not to duplicate FHWA's work). The guidance should cover how to identify and use the simplest tool to complete the analysis and how to document findings.
- Build and maintain a graphical user interface to incorporate defaults into the model interface being developed under NCHRP 25-48: "Combined Interface for Project Level Air Quality Analysis".

16. *Evaluate and develop approaches to address updates to the Council on Environmental Quality (CEQ) guidance on project-level GHG analysis (anticipated cost range: <\$150K).*

- Develop a protocol for how to complete the required analyses (taking care not to duplicate any work by FHWA).
- Document current practices (e.g., credit for GHG mitigation strategies using the INVEST program, FHWA's Sustainable Highways Self-Evaluation Tool).

17. *Assess citizen monitoring and provide recommended approaches to evaluate/use data if collected by DOTs (anticipated cost range: <\$150K).*

- Review the literature on the use of low-cost air quality sensors by the public and by state DOTs and document:
 - What the sensors are being used to accomplish
 - The quality of the data and how it relates to different applications

- How agencies are responding and recommendations for how agencies should respond
- A critical review of whether the use of low-cost sensing devices is an opportunity for DOTs or a concern

Appendix A. Near-Road Air Quality TPF Planning Workshop Materials

This appendix contains materials used during the workshop. These include the agenda, list of attendees, and workshop logistics; tables of draft potential projects that were developed based on pre-workshop phone calls and discussed during the workshop ([Tables A-1 and A-2](#)); and photographs of voting results and workshop participants ([Figures A-1 through A-6](#)).

October 2015 Near-Road Air Quality Pooled Fund Planning Workshop

8:00 a.m. to 5:00 p.m., October 28, 2015

Sonoma Technology, Inc., 1455 N. McDowell Blvd., Suite D, Petaluma, CA

Dress: business casual

Workshop Goals:

- 1) Prioritize future work beyond currently funded projects
- 2) Make decisions on accessibility of work products and website
- 3) Discuss a funding strategy to support future work
- 4) Discuss strategies for reaching out to other states for involvement

Time	Topic	Facilitators
8:00 – 8:30	Coffee and pastries	Ashley, Song
8:30 – 8:45	Welcome/introductions, handouts/logistics, goals for the day	Karin, Doug
8:45 – 9:30	2014 Strategic Plan review and status update <ol style="list-style-type: none"> a. Review TPF goals, project ideas, ranking b. Provide status update on work completed to date, funded work in progress, and current funding c. Discuss how to optimize/encourage website use d. Discuss accessibility of work products and website 	Steve R.
9:30 – 9:45	Morning break and beverage	
9:45 – 10:45	Identify future work options <ol style="list-style-type: none"> a. Interesting insights from recent PM studies b. Review planned phase 3 work under existing task orders c. Discuss unfunded projects in the strategic plan d. Discuss emerging needs from pre-workshop phone calls e. Open up the discussion to other ideas 	Steve B.
10:45 – 11:45	Discuss and prioritize future work options (Part 1 of 2) <ol style="list-style-type: none"> a. Discuss future work options 	Song
11:45 – 1:00	Break and lunch (brought in)	
1:00 – 2:00	Discuss and prioritize future work options (Part 2 of 2) <ol style="list-style-type: none"> a. Vote and prioritize potential projects b. Discuss voting results c. Discuss project timing (first ones; sequential vs. concurrent) 	Song
2:00 – 2:45	Discuss a funding strategy to support future work	Doug
2:45 – 3:00	Afternoon break and snacks	
3:00 – 3:50	Discuss strategies for involving other states	Doug, Karin
3:50 – 4:00	Phone/email break	
4:00 – 5:00	Workshop wrap-up and next steps <ol style="list-style-type: none"> a. Summarize group consensus b. Upcoming conference presentations c. TPF feedback (satisfaction, suggestions) 	Doug, Karin
5:00	Adjourn	

Workshop Attendees

(Alphabetically by last name)

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Workshop Logistics

- STI's wifi information.
- See handouts in binders.
- Use large paper taped to walls for group discussion.
- Use stickers for voting on priorities – colored by DOT (red) and STI (green).
- STI staff will help take notes.
- Guest office is available for visitor use.
- Coffee, pastries, snacks, and beverages will be available during breaks; lunch will be brought in at 11:45.

Table A-1. Priority topics and project ideas related to Strategic Plan from August/September calls with TPF participants (See: Abbreviated Strategic Plan Section 3.2, “Potential Projects”). Table summarizes topics mentioned by agencies during phone calls. Some items may be of interest to agencies but do not have a check mark because they were not specifically discussed with that agency during the call. [Material circulated prior to the October 2015 workshop.]

Project No.	Related Strategic Plan Goal (Project #)	Topics of Interest	Potential Projects	ADOT	Caltrans	TxDOT	VDOT	WSDOT	FHWA
1	2 (2)	Optimize use of TPF TO2 non-POAQC scoping study to minimize hot-spot analysis work loads	Documentation of the results of WSDOT’s (and others) efforts	✓				✓	
2	2 (2)	Brake and tire wear; re-entrained road dust	Leverage and expand upon work currently underway with Caltrans; Identify alternatives to AP-42	✓	✓				
3	3 (2 & 3)	Potential future changes to PM _{2.5} NAAQS and non-attainment areas, and meeting conformity requirements	Study to identify possible mitigation options, for example, relocate and reduce.	✓		✓			
4	1 & 2 (3)	Modeling performance evaluation using near-road data	Study to identify conditions (e.g., weather, VMT) that may contribute to higher concentrations near roads. Evaluate model performance under different conditions by modeling selected case studies and comparing model predictions to near-road air quality measurements			✓			

Project No.	Related Strategic Plan Goal (Project #)	Topics of Interest	Potential Projects	ADOT	Caltrans	TxDOT	VDOT	WSDOT	FHWA
5	2 (6)	Synthesis of recent DOT experience	Interview DOT staff about recent experience with project-level analyses Obtain tools used by states and assess transferability to other states Identify tool development needs	✓					
6	2 (7)	Resource allocation for project-level analyses	Document steps in the analysis chain on which project analysts should spend the most resources (time/budget) to best characterize their project	✓					
7	3 (8 & 13)	PM mitigation options (including assessment of barriers)	Leverage mitigation work currently underway with Caltrans; Develop a literature review on the quantitative benefits of barriers		✓				✓
8	2 (9)	Model Improvement Program (MIP) assessment and design	Review 2007 NRC report and assess and summarize current state of practice (focusing on what's being done to evaluate dispersion models) to support future NCHRP study that will offer recommendations				✓		

Table A-2. New priority topics and project ideas from August/September calls with TPF participants. Table summarizes topics mentioned by agencies during phone calls. Some items may be of interest to agencies but do not have a check mark because they were not specifically discussed with that agency during the call. [Material circulated prior to the October 2015 workshop.]

Project No.	Ideas Not Covered By Current Plan	Topics of Interest	Potential Projects	ADOT	Caltrans	TxDOT	VDOT	WSDOT	FHWA
9	2 (A)	Transitioning for Appendix W requirements to use AERMOD for CO project-level modeling	<p>Guidance for streamlining project-level CO analyses</p> <ul style="list-style-type: none"> - How to identify and use simplest tool to complete analysis - How to document if there is no problem 		✓		✓		✓
10	2 (B)	New O ₃ NAAQS, new non-attainment areas, and required conformity analyses (especially for new areas with no transportation planning agency where DOT will have to do project-level assessment)	<p>Guidance on how to perform the NO_x and VOC analyses</p>	✓	✓	✓			
11	2 (C)	Updates to CEQ guidance on project-level GHG analysis	<p>Develop a protocol for states to use to complete the necessary analysis;</p> <p>Document current practices (e.g., credit for GHG mitigation strategies using the INVEST program, FHWA's Sustainable Highways Self-Evaluation Tool)</p>	✓		✓	✓		

Project No.	Ideas Not Covered By Current Plan	Topics of Interest	Potential Projects	ADOT	Caltrans	TxDOT	VDOT	WSDOT	FHWA
12	1 (D)	UFPs	Evaluate relationship between traffic conditions (e.g., speed) and UFP emissions Assess UFP emissions trends and near-road impacts		✓				
13	2 (E)	Traffic data	Documentation on what other states are doing; information on resource allocation; work that supplements the pending NCHRP 25-25/Task 96 guidance on traffic data needed to complete air quality analyses	✓					
14	3 (F)	Emerging technologies and their impacts on air quality	Assess benefits of traffic improvement technology on PM (e.g., ITS, signaling, truck chaining);	✓					

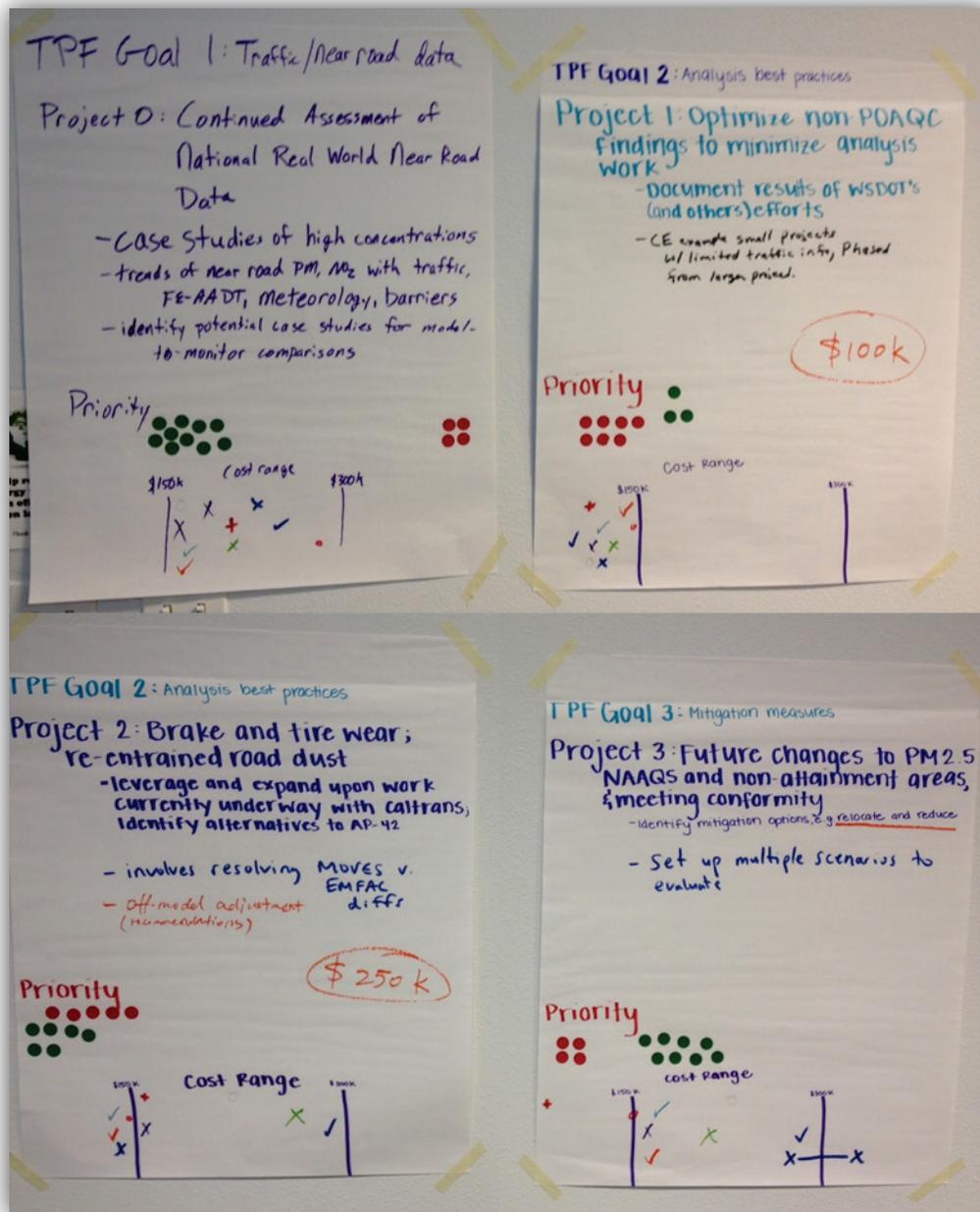


Figure A-1. Photographs of the newsprint pads used during the October 2015 workshop to vote for and prioritize potential projects. Red dots represent DOT/FHWA votes, and green dots represent STI votes. Participants also voted on the estimated cost range associated with each potential project. Project numbers refer to Tables A-1 and A-2.

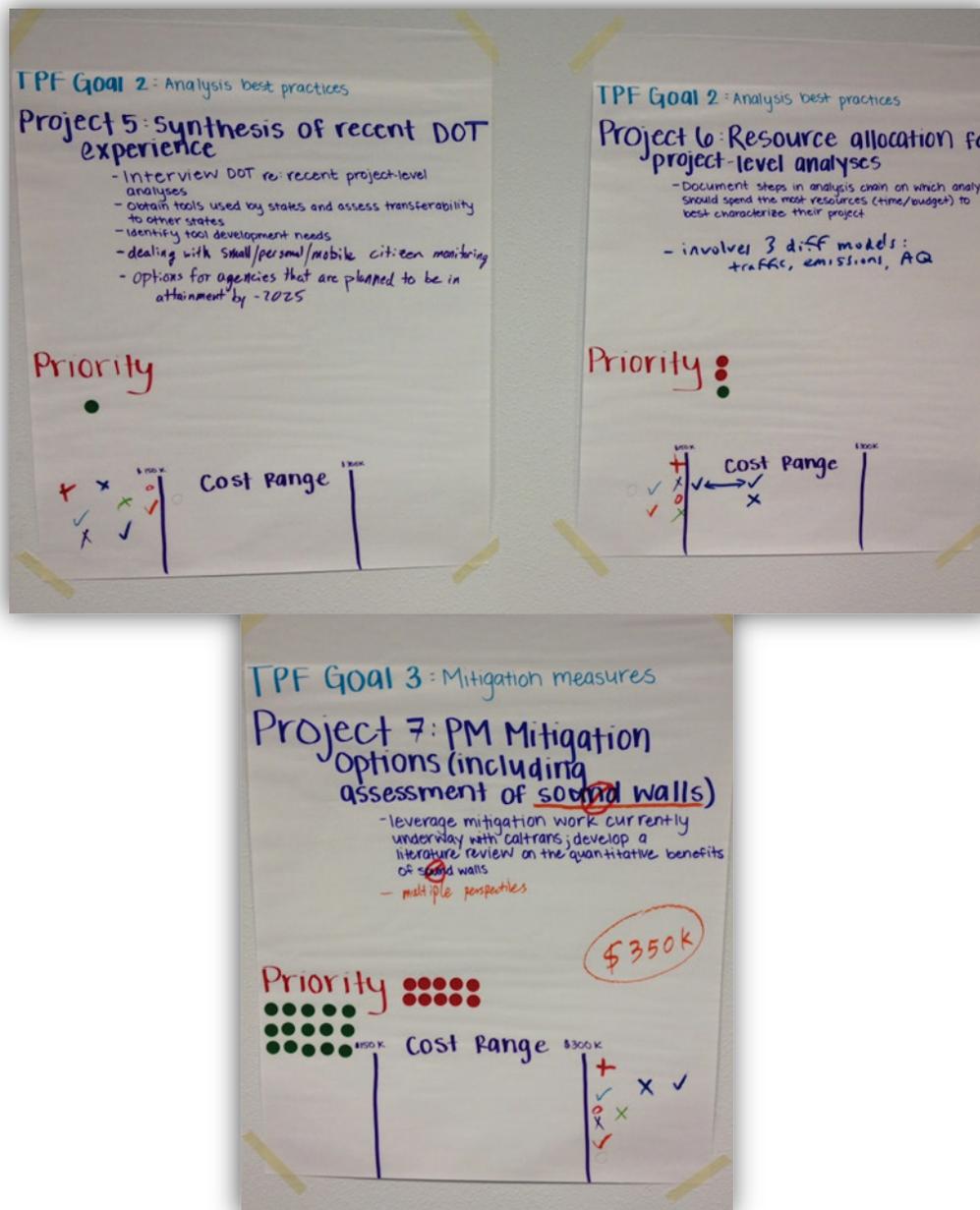


Figure A-2. Photographs of the newspaper pads used during the October 2015 workshop to vote for and prioritize potential projects. Red dots represent DOT/FHWA votes, and green dots represent STI votes. Participants also voted on the estimated cost range associated with each potential project. Project numbers refer to Tables A-1 and A-2.

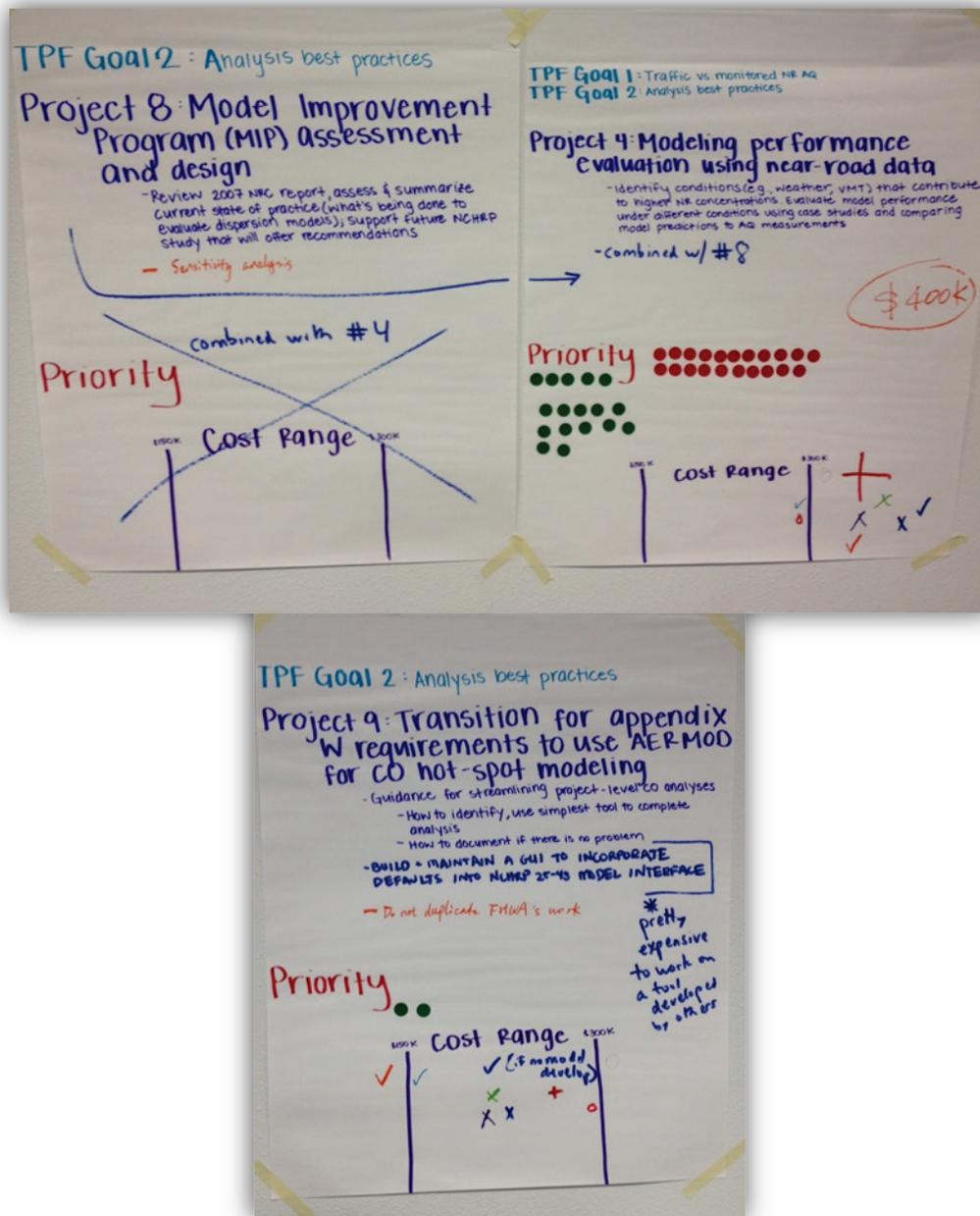


Figure A-3. Photographs of the newspaper pads used during the October 2015 workshop to vote for and prioritize potential projects. Red dots represent DOT/FHWA votes, and green dots represent STI votes. Participants also voted on the estimated cost range associated with each potential project. Project numbers refer to Tables A-1 and A-2.

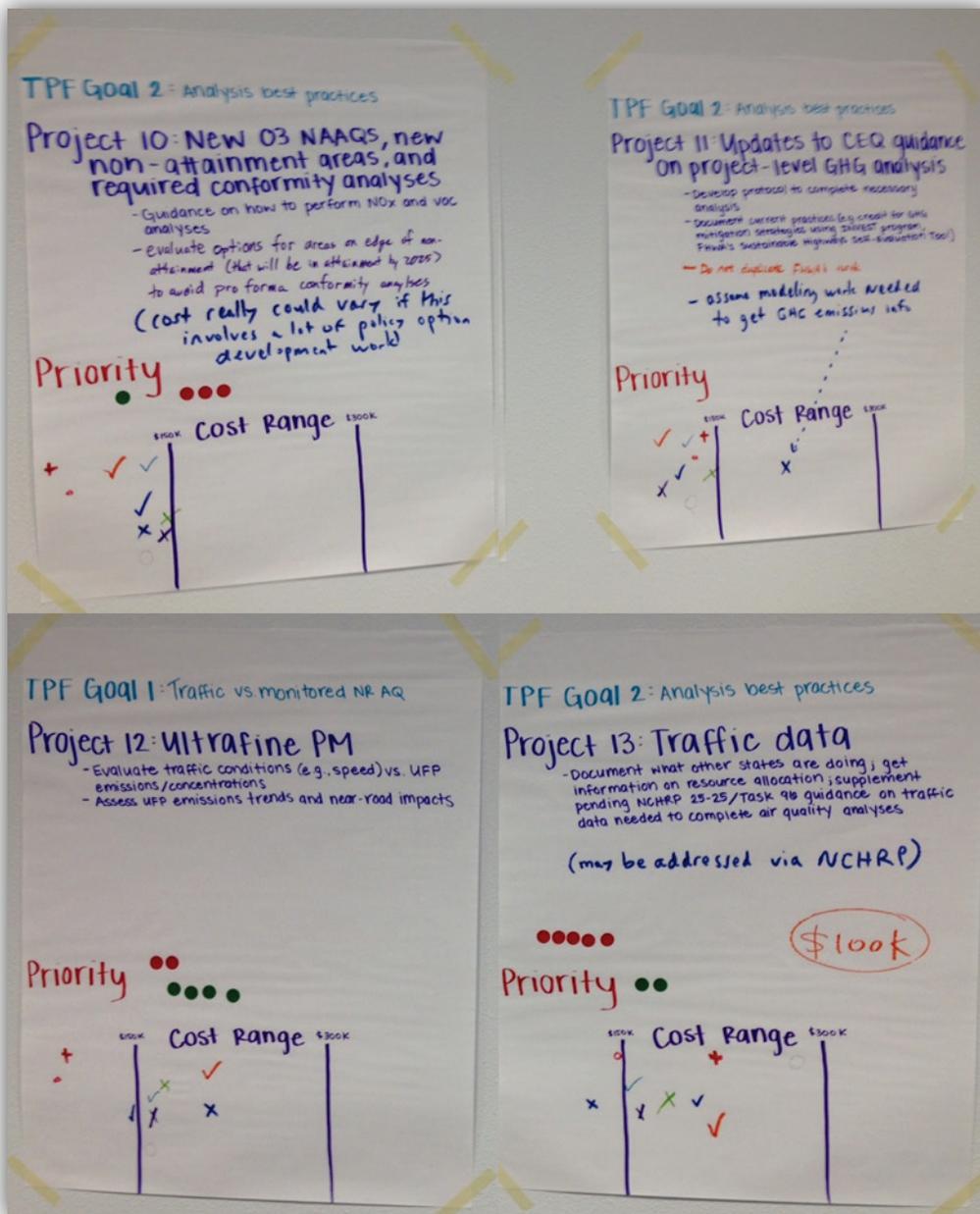


Figure A-4. Photographs of the newspaper pads used during the October 2015 workshop to vote for and prioritize potential projects. Red dots represent DOT/FHWA votes, and green dots represent STI votes. Participants also voted on the estimated cost range associated with each potential project. Project numbers refer to Tables A-1 and A-2.

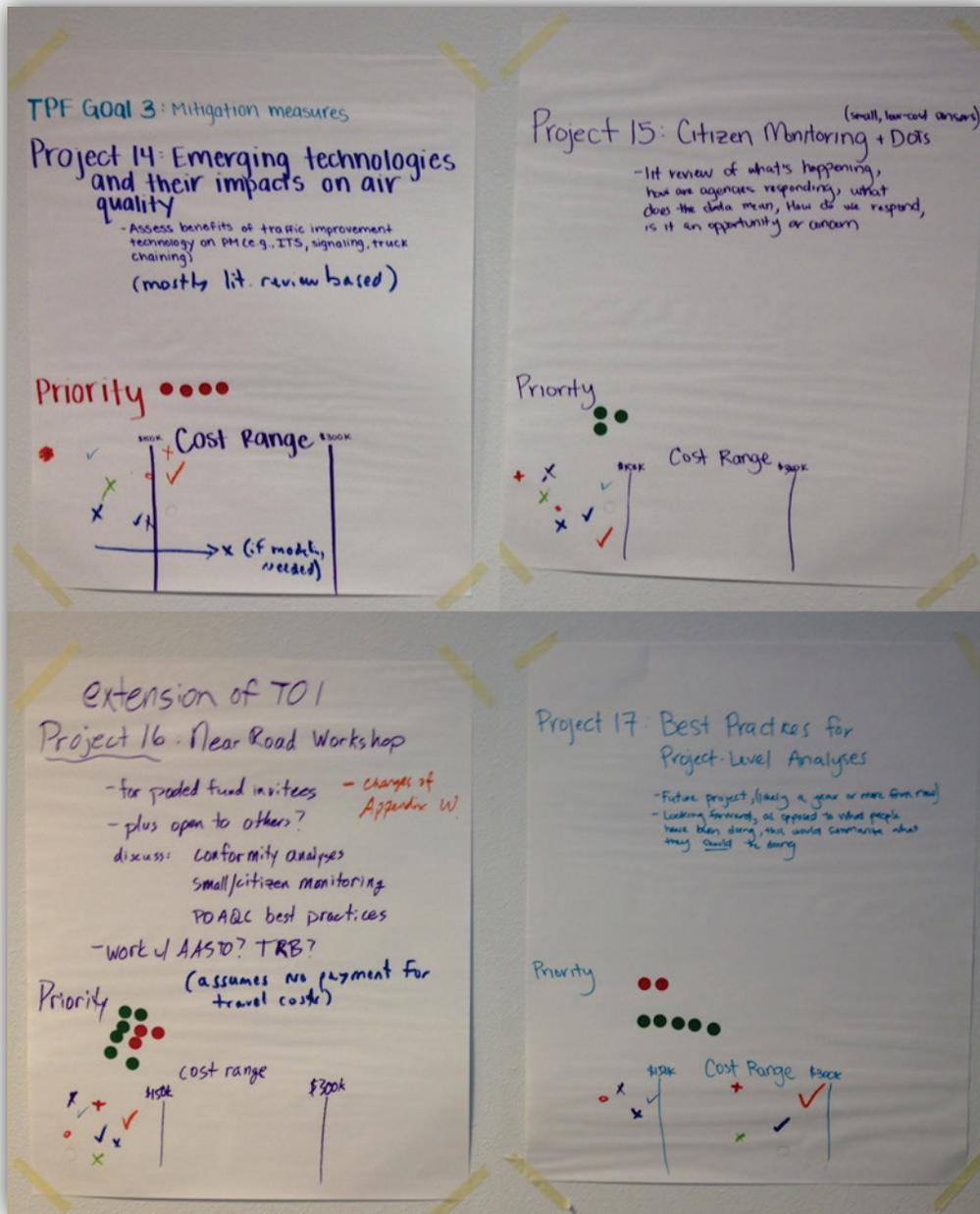


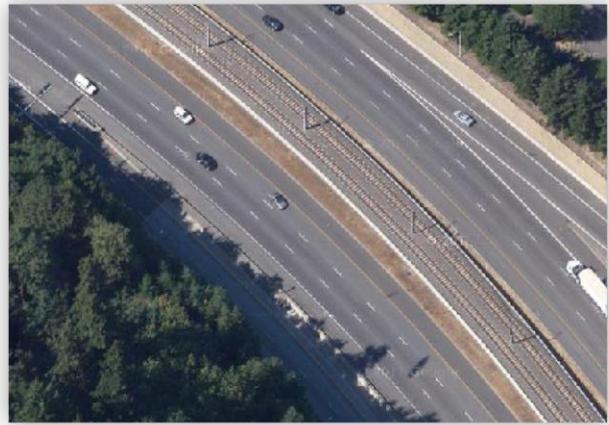
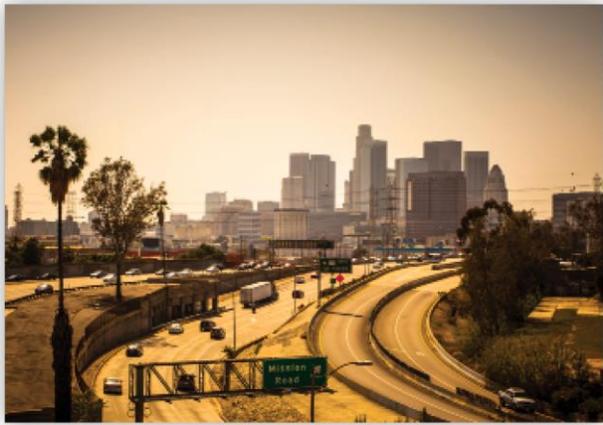
Figure A-5. Photographs of the newspaper pads used during the October 2015 workshop to vote for and prioritize potential projects. Red dots represent DOT/FHWA votes, and green dots represent STI votes. Participants also voted on the estimated cost range associated with each potential project. Project numbers refer to Tables A-1 and A-2.



Figure A-6. Photographs of the meeting participants taken during the October 2015 workshop hosted in STI's conference room.

Appendix B. October 2014 Five-Year Strategic Research Plan [*abbreviated version*]

TPF-5(284) Near-Road Transportation Pooled Fund: Five-Year Strategic Research Plan



Revised Final Plan [*abbreviated version*] prepared for

Washington State Department of Transportation
Seattle, WA

October 2014

STi
Sonoma Technology, Inc.



TPF-5(284) Near-Road Transportation Pooled Fund: Five-Year Strategic Research Plan

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Contents

- 1. Introduction 1
- 2. Methods 2
- 3. Workshop Results 3
 - 3.1 Key Goals 3
 - 3.2 Potential Projects 4
- 4. Implementation Plan 6
 - 4.1 Proposed Task Orders and Budgets for the First Round of Work Under the TPF 6
 - 4.2 Implementation: First Round of Task Orders 7

Figures

- 1. Proposed timeline for conducting work phases of the first round of TPF task orders 7

Tables

- 1. Summary of potential TPF projects and associated proposed strategic goals 4
- 2. Summary of first round TPF task orders with proposed work scopes and budgets 6

Cover graphic illustrates vehicles, traffic, and forms of transportation infrastructure that are related to near-road air quality impact assessment.

1. Introduction

This five-year strategic plan will guide the Near-Road Air Quality Transportation Pooled Fund (TPF) partnership, led by the Washington State Department of Transportation (WSDOT), in developing and completing near-road air quality research, analysis, and tool development projects. WSDOT and its state and federal agency partners created the TPF to help agencies identify and address a broad range of near-road issues. As stated in the initial TPF announcement:¹

New federal regulations require state and local agencies to monitor near-roadway emissions and quantitatively assess potential for air quality impacts (“hot-spots”). State DOTs need to understand the implications of the new near-road data being collected; develop analysis methods and expertise to complete hot-spot modeling; and implement effective mitigation. Many states are unable to internally address all of the new emissions modeling and measurement requirements with existing resources. State DOTs need help meeting new near-road air quality analysis requirements and responding to stakeholder requests for information about near-road air pollution.

Currently, there is no forum dedicated to facilitating information and technology transfer related to near-road pollution issues. A pooled fund would allow for coordinated sharing of critical research developments, evaluation techniques, and study results to reduce overall costs and promote project delivery. It would provide a unique venue for collaboration between state DOTs and FHWA to clarify near-road emissions challenges, prioritize research needs, discourage redundant individual state efforts, and to quickly initiate research that develops solutions that meet the needs of multiple states.

Key motivators for the TPF include U.S. Environmental Protection Agency (EPA) requirements to quantitatively evaluate potential particulate matter (PM) hot-spots, EPA and Federal Highway Administration (FHWA) requirements to assess mobile source air toxics (MSATs), and recently implemented EPA requirements to monitor air quality near heavily traveled roads. As of August 2014, TPF participants include FHWA and several state DOTs, including those from Arizona, California, Texas, Virginia, and Washington. Sonoma Technology, Inc. (STI) was awarded a TPF support contract and is responsible for completing projects to meet TPF goals.

¹ See: <http://www.pooledfund.org/Details/Study/526>.

2. Methods

To facilitate the creation of this strategic research plan, STI hosted a one-day workshop to discuss and prioritize goals and research projects. Prior to the workshop, STI performed the following tasks to prepare draft goals and potential projects for discussion:

- Contacted TPF participants to assess their highest priority issues, challenges, and needs, and to solicit their ideas for TPF goals and projects.
- Reviewed air quality research needs compiled by the Transportation and Air Quality Committee (ADC20) of the U.S. Transportation Research Board (TRB).
- Reviewed the air quality research needs statements from the Transportation and Environmental Research Ideas (TERI) database maintained by the Center for Environmental Excellence by the American Association of State Highway and Transportation Officials (AASHTO).

STI then synthesized the research needs and interview results to create draft goals and potential projects for discussion during the one-day workshop, held on June 6, 2014, at the STI office in Petaluma, California. Representatives from each of the TPF partner organizations participated, either in person or over the phone. The workshop consisted of roundtable discussions, small group breakout discussions, and voting for goals and projects. Vote totals were used to inform discussion, prioritize goals and projects, and provide rough cost guidelines to consider when scoping future projects.

3. Workshop Results

3.1 Key Goals

Overall TPF Objective: *Improve the state of knowledge regarding, and the ability of state DOT staff to address, near-road air quality issues.*

1. Increase knowledge of the relationship between traffic conditions and monitored near-road air quality data by
 - Obtaining, assessing, and summarizing available near-road monitoring data (including, but not limited to, PM_{2.5}, PM₁₀, MSATs, NO₂, and ultrafine particles) from new near-road monitors and special near-road field studies (where and when available)
 - Identifying trends and technically robust screening thresholds
 - Periodically synthesizing near-road monitoring studies, research, and literature
 - Developing case studies
 - Creating technical assistance resources and training materials
2. Improve best practices for project-level analyses by
 - Developing and streamlining project screening to help meet Clean Air Act (CAA) requirements
 - Building and evaluating case studies
 - Developing user-friendly tools and web-based applications
 - Performing periodic evaluation of new and emerging tools, research, and literature for completing project-level analyses
 - Creating technical assistance resources and training materials
3. Increase knowledge of operational and construction mitigation measures that support near-road air quality improvements by
 - Identifying and selecting promising measures
 - Assessing implementation feasibility
 - Quantifying the benefits of the mitigation measures
 - Performing periodic evaluation of new and emerging tools, research, and literature for operational and construction mitigation measures
 - Creating technical assistance resources and training materials
4. Improve interagency exchange of information by
 - Providing electronic platforms and venues for sharing case study analysis results, lessons learned, best practices, templates, and other information
 - Enabling interagency partners to identify and resolve technical and policy issues

3.2 Potential Projects

During the workshop, TPF partners discussed, ranked, and estimated approximate costs for potential projects to meet the TPF goals identified in Section 3.1 (see [Table 1](#)).

Table 1. Summary of potential TPF projects and associated proposed strategic goals. A check mark (✓) indicates a project that meets the primary strategic goal; a circle (●) indicates a project that meets secondary strategic goals; a cross mark (x) indicates the anticipated project cost range.

Page 1 of 2

Group	Rank	Potential Projects	Strategic Goals				Cost Range ^a		
			Traffic and monitored data	Project-level best practices	Mitigation	Information exchange	Below \$150K	\$150K to \$300K	Above \$300K
High	1	Exploratory scoping study to identify potential project types and situations that will not create PM hot spots	●	✓	●	●			x
	2	National data assessment and periodic network monitoring reports and near-road literature synthesis	✓					x	
	3	Modeling performance evaluation under different conditions (when more near-road data are available)	●	✓		●			x
	4	Information sharing website and forum	●	●		✓		x	
	5	Case study assessment of the benefits of truck retrofits using California’s Schuyler-Heim Bridge	●	●	✓	●		x	

^a The cost range identified here is approximate and is meant to provide a qualitative guide when scaling work scopes to available budgets.

Table 1. Summary of potential TPF projects and associated proposed strategic goals. A check mark (✓) indicates a project that meets the primary strategic goal; a circle (●) indicates a project that meets secondary strategic goals; a cross mark (x) indicates the anticipated project cost range.

Group	Rank	Potential Projects	Strategic Goals				Cost Range ^a		
			Traffic and monitored data	Project-level best practices	Mitigation	Information exchange	Below \$150K	\$150K to \$300K	Above \$300K
Medium	6	Synthesis of recent DOT project analysts' experience (focusing on PM hot spots)		✓	●	●	x		
	7	Resource allocation and prioritization for project-level analyses (focusing on PM hot spots)		✓	●	●		x	
	8	Vegetative screen and sound wall assessment	●		✓	●	x		
	9	Tool development to assess PM, toxics, and other important pollutant issues		✓					x
Low	10	General consultation and client assistance	●	✓	●	●	x		
	11	Annual near-road workshop	●	●		✓	x		
	12	Literature review of linkage between indoor and outdoor near-road air quality	✓				x		
	13	Mitigation literature review and compendium of options			✓	●	x		
	14	Indoor air filtration system assessment	●		✓	●	x		

^a The cost range identified here is approximate and is meant to provide a qualitative guide when scaling work scopes to available budgets.

4. Implementation Plan

4.1 Proposed Task Orders and Budgets for the First Round of Work Under the TPF

This discussion identifies the first round of task orders to be completed under the TPF (Table 2).

Table 2. Summary of first round TPF task orders with proposed work scopes and budgets. TO 1 was to facilitate and host the one-day workshop and create this five-year strategic plan.

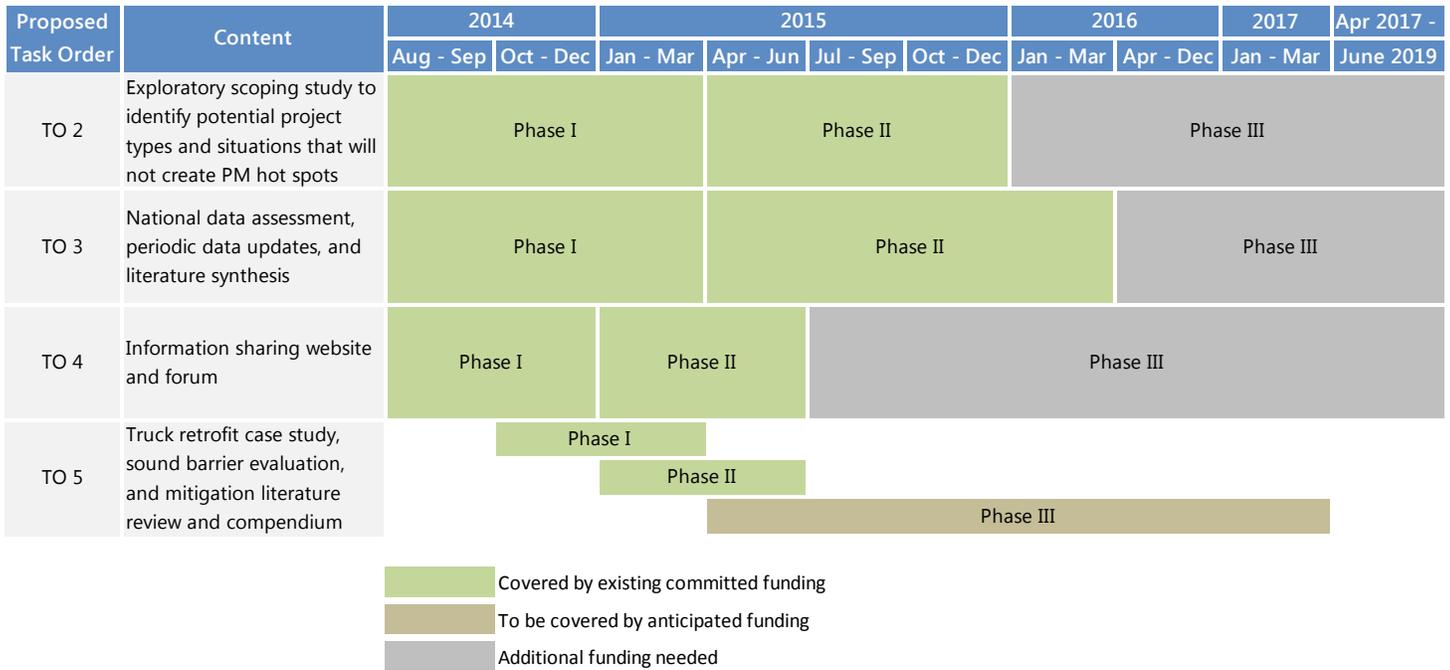
Proposed Task Order	Content	Phase I		Phase II		Phase III		Total Budget
		Key Work Scope	Budget	Key Work Scope	Budget	Key Work Scope	Budget	
TO 2	Exploratory scoping study to identify potential project types and situations that will not create PM hot spots	Freeway case study	\$200K	Intersection case study	\$240K	Tool development	\$300K	\$740K
TO 3	National data assessment, periodic data updates, and literature synthesis	Initial data assembly and assessment	\$100K	Full data assembly, update national assessment, and perform case studies	\$150K	Periodically update database and assessment, perform case studies	\$320K	\$570K
TO 4	Information sharing website and forum	Develop mock-up and deploy initial website	\$60K	Complete website development and continue operations	\$80K	Host, maintain, and update website	\$160K	\$300K
TO 5	Truck retrofit case study, sound barrier evaluation, and mitigation literature review and compendium	Schuyler-Heim Bridge truck retrofit program case study	\$60K	Sound barrier effects on near-road pollutant concentrations	\$75K	Mitigation measures reference document and case studies	\$225K	\$360K
Totals		Phase I Sum:	\$420K	Phase II Sum:	\$545K	Phase III Sum:	\$1,005K	\$1,970K

- Covered (approximately) by existing committed funding (\$946K remaining of original \$1.01M)
- To be covered (approximately) by anticipated FY 14/15 Caltrans funding (\$250K); TPF participants may shift funded TOs/phases
- Additional funding needed to complete all phases of first-round (\$780K, excluding anticipated Caltrans funds)

Note: this table was updated as of April 2015 to reflect funding commitments to date

4.2 Implementation: First Round of Task Orders

A proposed timeline for conducting the first round of pooled fund task orders is shown in **Figure 1**.



Note: this figure was updated as of April 2015 to reflect funding commitments to date

Figure 1. Proposed timeline for conducting work phases of the first round of TPF task orders. TO 1 was to facilitate the one-day workshop and create the five-year strategic plan (this document).