

**R09: Managing Risk on Rapid Renewal  
Projects**

**SUMMARY REPORT**

**Peer Exchange Workshop**

*January 31 and February 1, 2017  
Orlando, Florida*

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**Technical Report Documentation Page**

<b>1. Report No.</b>	<b>2. Government Accession No.</b>	<b>3. Recipient's Catalog No.</b>	
<b>4. Title and Subtitle</b> SHRP2 R09 Peer Exchange Workshop – Managing Risk on Rapid Renewal Projects		<b>5. Report Date</b> April 2017	
		<b>6. Performing Organization Code</b>	
<b>7. Author(s)</b> Jerry A. DiMaggio		<b>8. Performing Organization Report No.</b>	
<b>9. Performing Organization Name and Address</b> Applied Research Associates, Inc. 100, Trade Centre Drive, Suite 200 Champaign, IL 61820		<b>10. Work Unit No. (TRAVIS)</b>	
		<b>11. Contract or Grant No.</b>	
<b>12. Sponsoring Agency Name and Address</b> Federal Highway Administration Second Strategic Highway Research Program (SHRP2) 1200 New Jersey Avenue, SE Washington, D.C. 20590		<b>13. Type of Report and Period Covered</b>	
		<b>14. Sponsoring Agency Code</b>	
<b>15. Supplementary Notes</b>			
<b>16. Abstract</b> This report documents the proceedings of the 2-day Second Strategic Highway Research Program (SHRP2) R09 Peer Exchange Workshop held in Orlando, Florida, on January 31 and February 1, 2017. This report includes an abstract of topics presented in the workshop and captures the discussion of participants. The peer exchange participants also shared risk management practices from the participating States.			
<b>17. Key Words</b> Risk management, complex projects, project and program delivery, risk management template		<b>18. Distribution Statement</b> No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161.	
<b>19. Security Classification (of this report)</b> Unclassified	<b>20. Security Classification (of this page)</b> Unclassified	<b>21. No. of Pages</b> 42	<b>22. Price</b>

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

AASHTO	American Association of State Highway and Transportation Officials
ARA	Applied Research Associates, Inc.
DOT	Department of Transportation
FHWA	Federal Highway Administration
FLHD	Federal Lands Highway Division
LOS	Level of Service
MAG	Maricopa (AZ) Association of Governments
MnDOT	Minnesota Department of Transportation
MPO	Metropolitan Planning Organization
NEPA	National Environmental Policy Act
PennDOT	Pennsylvania Department of Transportation
PRHTA	Puerto Rico Highway and Transportation Authority
Q&A	Question and Answer
ROI	Return on Investment
SHRP2	Second Strategic Highway Research Program

## INTRODUCTION

Historically, many complex projects experience poor performance, exceed cost and schedule estimates, have more disruption, and have less longevity than planned. These issues often are caused by unanticipated problems (including invalid assumptions), which possibly could have been anticipated and planned for. Risk management has been recognized as a best practice since the 1970s and yet has not been broadly implemented by the vast majority of transportation agencies. Widely used by private companies and some public agencies, risk management has been proven to be a cost-effective and powerful process to improve project performance.

The Second Strategic Highway Research Program (SHRP2) Renewal (R09) product, Managing Risk on Rapid Renewal Projects, focuses on a mean value quantitative method of identifying, assessing, and managing risk using the Delphi Elicitation approach of expert opinion. The experts identify risks, assess probability of occurrence, cost, duration, and disruption impacts, and determine effective mitigation strategies to minimize negative risks (threats) and optimize positive risks (opportunities) using an open source Microsoft Excel risk management template. This template establishes a middle ground between qualitative methods and full probabilistic methods of risk management. The overall objective of R09 was to provide a tool which could be immediately beneficial to transportation agencies and professionals. Equally important was to provide a tool and training which transportation agencies could apply internally, without an external facilitator, and which could be tailored to the local culture and to the policies of each transportation agency.

The R09 risk management process includes the following steps:

1. Project scope/strategies/conditions
2. Structuring
3. Risk identification
4. Risk assessment
5. Risk analysis
6. Risk management planning
7. Risk management implementation

The implementation strategies to deploy the R09 process included:

- Demonstration workshops
- Facilitator trainings
- Peer exchange and this summary report
- Case studies
- Technical assistance to assist in the development of DOTs' risk management policies and procedures.
- Communications and outreach (factsheets, case studies, videos, presentations).

The primary purpose of the R09 demonstration workshops—executed by the Federal Highway Administration (FHWA)—is to facilitate an open dialogue among participants working on a complex project. The objectives are to provide an enhanced risk management tool and assist with development of improved risk management processes and procedures which can be implemented to complement their individual current risk management use.

The objective of the train-the-facilitator training sessions-executed by the Federal Highway Administration (FHWA)-is to train DOT personnel on the use of the R09 Excel risk management template and potentially for participants to serve as facilitators or risk management workshops others within their respective organization.

A peer exchange workshop was conducted in Orlando, Florida, with representatives from State departments of transportation (DOTs) that previously participated in the R09 demonstration workshops and have used the R09 Excel risk management template on a project. Some DOTs also hosted one or more “train-the-facilitator” training sessions. The workshop focused on lessons learned, implementation results, and the objectives included:

- Share R09 implementation efforts to date.
- Present and document R09 risk management practices and lessons learned.
- Provide an update on the latest R09 Excel risk management template and implementation strategies.
- Seek feedback and recommendations about the R09 process, template, and overall implementation.
- Provide a networking opportunity for the participants to collaborate and help other DOTs interested in risk management by sharing:
  - Key factors that contributed to R09 implementation
  - Steps non-SHRP2 DOTs should consider to implement risk management
- Document peer exchange and evaluate R09 implementation:
  - Case study video
  - Interviews and surveys for evaluation of R09 Implementation

## WORKSHOP SUMMARY

Mr. Jerry A. DiMaggio and Mr. Kevin Chesnik, from Applied Research Associates, Inc. (ARA), facilitated the workshop, held at the Hyatt Place Orlando Airport in Orlando, Florida. **Appendix A** provides a list of the workshop participants. Representatives from the Florida DOT, Oregon DOT, Pennsylvania DOT, Minnesota DOT, Wisconsin DOT, Puerto Rico Highway and Transportation Authority (PRHTA), Arizona DOT, Alabama DOT, FHWA Federal Lands Highway Division (FLHD), Colorado DOT, FHWA, and the American Association of State Highway and Transportation Officials (AASHTO) were on hand to show their support and to take part in the workshop.

Mr. Carlos F. Figueroa of FHWA and Mr. Keith Platte of AASHTO provided opening remarks. Mr. Brian Blanchard, Florida DOT Assistant Secretary of Engineering and Operations, and Mr. Henry Pinzon, Florida Turnpike Environmental Manager, welcomed all participants. They communicated their support and the importance of risk management for the Florida DOT transportation program, as well as the need for centerpiece research products such as R09 to further advance the effective use of risk management principles.

Prior to the beginning of the formal presentations, Mr. DiMaggio reviewed the agenda (see **Appendix B**) and introduced the participants to the format and content of the peer exchange workbook. The agenda format was structured such that a facilitated question and answer (Q&A) period followed each presentation. This report provides a summary of each Q&A period directly following the summary of each presentation.

### SUMMARY OF R09 RISK MANAGEMENT DEPLOYMENT TO DATE

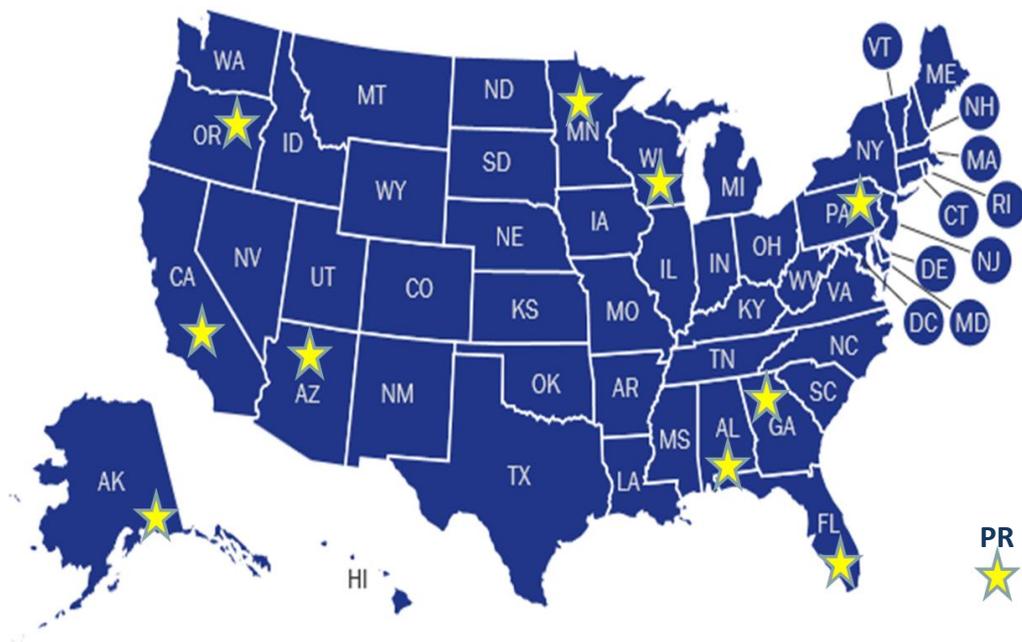
Mr. DiMaggio and Mr. Chesnik began the peer exchange by presenting a summary of deployment to date, which included a brief review of risk management development and current national state of practice, the number and locations of R09 demonstration workshops and train-the-facilitator courses, summary results of a Risk Management survey (see **Appendix C**), and suggested next steps. The introduction of next steps during this portion of the program was to generate key ideas for the discussion and Q&A periods.

During the initial part of this presentation, participants discussed risk management topics such as the following:

- Current state of risk management practice within the U.S. highway community.
- Generally accepted benefits and limitations of risk management.
- R09 risk management process.
- Value of the R09 risk management tool.
- A comparison between the outcomes of the cost estimating reviews required by FHWA for all major projects (>\$500M) and the R09 process.

- Comparison and cross reference between the R09 template steps, the R09 train-the-facilitator course modules, and the R09 guidebook chapters.

The second portion of this presentation provided a summary of the transportation agencies that participated in the proof of concept, lead adopter, and user incentive phases of the SHRP2 R09 implementation program. The presentation also included a geographic map (Figure 1) and time bar chart of the R09 implementation activities. A total of 23 R09 workshops and R09 trainings were delivered between 2013 and 2016, which included bridge, capacity expansion, maintenance, and trail projects.



**Figure 1- Map of the DOTs implementing R09-*Managing Risk on Rapid Renewal Projects***

Mr. Chesnik presented material that summarized the pre-workshop survey topics and results. The survey topics included:

- Risk register and analysis summary
- Risk management obstacles
- Risk management lessons learned
- Current or anticipated obstacles to implementing risk management and using R09 tools.
- Success in developing risk management and the R09 risk management tools used.

The survey results for each topic are summarized below.

### **Risk Management and Analysis Summary**

- All DOTs indicated that their managements support risk management policy development.
- Most DOTs are not measuring return on investment (ROI) of risk management. Four DOTs are looking for performance measures or ROI but have not developed metrics.
- Most participants had not been exposed to a formal risk management process.
- Most saw the value of team and stakeholder participation.
- Most recognized the value of the risk process: identification, prioritization, and mitigation.
- Most did not feel comfortable assigning ratings using the Delphi process.
- Almost all indicated they would need additional assistance before they could comfortably use the tool.
- Almost all thought the process was too time-consuming.
- Almost all wondered how the process would fit into how they currently conducted business.
- Almost all struggled with how to demonstrate the benefit/cost value of risk management.

### **Risk Management Obstacles**

- A notable comment was: "That's not how we've done it before."
- Disagreement in what the risks are, severity, and mitigation approaches, etc.
- Too large of a group during workshop.
- How does risk management get implemented without adding considerable work to project managers?
- How will project managers and executive staff be convinced that this will enhance project delivery?
- How will the roll-out be done to prevent a backlash?
- How will the roll-out to planning partners be accomplished?
- The new terminology for risk management will take time to adopt and understand.
- Project managers/designers see the process as a judgment of their work.

- It can be difficult to get a project team and other experts together for risk workshops.
- Efforts to populate the tools during the workshop were considered too slow, and participants tended to disengage.
- Feedback has consistently been that tools need to be easy to learn to use.
- Tool complexity creates retention and training issues.
- Workshops take time and money; the return on investment (ROI) on smaller/less complex projects is an issue.

## **Risk Management Lessons Learned**

- Gathering people from different fields (construction, geotechnical, utilities, etc.) helps to highlight future considerations and risks.
- Consider meeting in smaller groups instead of a large one.
- Make sure everybody understands the parameters (type or risks, severity levels, etc.).
- Set up risk factors (cost and time) comparable to the project size.
- Require workshop attendance by representative from each technical group.
- Support from leadership/upper management is critical to advance risk management.
- Need a vocal champion who communicates regularly with project managers and middle management.
- Building experience and expertise in risk management is important.
- Getting project teams to understand risk is not always bad, and “risk” is not a bad word.
- Conduct preparation session prior to workshop.
- Florida DOT arranges the workshop agenda schedule to minimize the participants’ time. The agenda is established in a way to avoid having staff attend a session where they have no input. Florida DOT typically invites the entire list of participants to the risk assessment process review, project overview, base cost & schedule presentations and a discussion of risky areas on the project. The rest of the workshop is broken out into various disciplines and attendees can attend as needed. For example, a subject matter expert (SME) for drainage will not have to attend the session on tolling risks. The risk facilitator will act as a coordinator if various SMEs are needed in other disciplines. The construction SME generally attends all discipline sessions.
- Coordinate early with FHWA on workshops for major projects.
- Be aware of internal and external political sensitivities.
- Connect value engineering and risk management processes (share/flow information).
- It is hard to establish a solid risk management practice without long-term continued efforts of fully dedicated staff.
- Project staff including champions move on to other roles and leave the agency more frequently than thought. This is making recruitment of champions an ongoing challenge.
- Tools that have a “lite” version or take a tiered approach would help.
- Have a detailed assessment of the project conditions (at least conceptual design).
- Change perceptions that working with risk assessment is difficult and time-consuming.

- Risks change over time. Perceived low risks can become high risks, and new risks appear during the project life cycle. Previously unknown risks can substantially delay a project. For all these reasons, constant monitoring is important.
- Frequent cross functional team communication is needed, and frequent partner communication is needed.

## **Current or Anticipated Obstacles to Implementing Risk Management and Using R09 Tools**

- Project managers/designers see the process as a judgment of their work.
- Performance measures: What is the “bang for the buck”?
- Leadership change.
- Time to prove this is an effective practice.
- Statewide concurrence to make this a standard practice.
- The lack of resources and experience in facilitating or conducting risk workshops.
- Identifying the type and size of projects (evaluation criteria) that are good candidates for utilizing R09 tools.
- Programming projects, market conditions, and utilization and management of the R09 tool during project development.
- Bringing a “new” process/procedure to project managers and asking them to implement.
- Long-term maintenance and support for the R09 tool.

## **Success in Developing Risk Management and the R09 Risk Management Tools Used**

- **Florida DOT:**
  - Monthly district teams
  - FHWA Risk Workshop Facilitator training
  - Florida DOT Design Expo Training – Risk Management (4 years)
  - Self-modeling tool training (2 years)
  - Conducted 40+ workshops
- **Oregon DOT:**
  - The adoption of risk management within the guidance for project development overall is a huge win.
  - The project management plan is a living document and includes a section for risk management throughout the design development life cycle.
  - The DOT convened a multi-disciplined team and further developed risk management documentation, including a tiered guidance approach that allows staff to assess their projects and choose tools available to support their projects.
- **Arizona DOT:**
  - The DOT, through the metropolitan planning organization (MPO), is utilizing a consultant to conduct risk analysis workshops for urban projects in the Phoenix area. They have successfully utilized the risk management tool on projects, identifying and planning to manage those risks.

- The Maricopa Association of Governments (MAG) also has developed an online database to track, update, and manage risks for projects. This process has helped mitigate utilities, right-of-way, and other conflicts. They also have identified constructability concerns associated with some items of work and have recommended as options to consider during design.
- The DOT utilized the R09 risk management tool on the Design-Build US60/Bell Road project in Surprise, AZ and were successful in mitigating utilities and right-of-way risk early on, to deliver the project ahead of the anticipated schedule.
- **Pennsylvania DOT:**
  - The DOT has developed a risk management policy, a tailored risk management template based on R09 principles and a 2-day training program for their internal staff and consultants.
- **Minnesota DOT:**
  - The DOT has been approaching risk management as a tool for promoting good project management practices. MnDOT sees risk management as a way in helping Project Managers recognize and more fully develop the scope of work during the scoping phase of the project and sticking with the scope that was initially developed (i.e. discourage scope creep).
- **Puerto Rico Highway and Transportation Authority (PRHTA):**
  - The PRHTA is currently developing a risk management policy and implementation document based on the R09 process.
- **Alabama DOT:**
  - The DOT has just been introduced to risk management through a R09 Workshop on the I-10 Mobile River Bridge & Bayway project, but the R09 experience clearly demonstrated its value on this project.
- **FHWA Federal Lands Highway Division (FLH):**
  - FLH has a structured risk management process which is used at both the program and project levels. The structured process includes the following components.
    - Program Risk Management Tools
      - Brainstorming
      - Scenario Planning
      - Qualitative Risk Assessment Techniques
      - Mitigation Plans
    - Project Risk Management Tools
      - Qualitative Risk Assessment Techniques
      - Risk Registers, Mitigation Strategies
      - Very Proactive in Managing Schedules and Budgets
      - Earned Value, CPM Schedules, Change Control Process
      - Frequent Cross Functional Team Communication
- **Wisconsin DOT:**
  - Wisconsin DOT is developing an internal system to include elements and concepts from the R09 process to be integrated with other project management processes.

**Note:** Additional information including the presentations from the participating transportation agencies, is available on the following SharePoint site:  
<https://aratrans.sharefile.com/app/#/home/shared/foa2c555-a24b-47af-8b19-a19e13c868e2>

This introductory session was concluded by focusing on two key topics:

- **What additional assistance do transportation agencies need to advance the use of risk management?**
  - Learn how other agencies were able to start using this practice.
  - Risk management program return on investment (ROI) and performance metrics.
  - Review of the risk management policy during the implementation of the R09 template for future selected projects.
  - Interest in looking at risk at the program level for collections of projects that are within the State Transportation Improvement Program (STIP)—for example, all projects within a region, all pavement preservation projects in a region or all regions, statewide bridge repairs, etc.
  - It would be very helpful to have information about cost/time savings that can be generated by using risk management techniques (i.e., ROI).
  - Interest in other agencies that are looking at a simplified risk register that would suffice for a majority of projects.
  
- **What are the immediate next steps to develop success?**
  - Need for additional technical assistance.
  - Need to integrate risk management into current agency project delivery policy and procedures.
  - Need to establish a “formal” risk management policy for the agency, including assigned staff with resources, authority, and responsibility.
  - Need to develop effective coordination and communication tools with upper management and key team members and stakeholders.
  - Need to develop effective tools to demonstrate the benefit/cost relationship for risk management exercises.
  - Need to develop convenient and effective methods of risk meeting/workshop follow-up and documentation.

As part of the peer exchange participation, each agency was asked to address the following topics within their presentation:

- Agency Organization
- Risk Management Background
- Risk Management Implementation Activities
- R09 Demonstration Workshop Project Description and Risk Register Developed
- R09 Risk Analysis Performed
- R09 Risk Management Obstacles (actual and anticipated)

- R09 Risk Management Lessons Learned
- Comments - R09 Risk Management Delphi approach
- Comments - R09 Risk Management Excel Template tool
- Conclusions and recommendations for advancement of risk management in their agency.
- DOT risk management contact information.

The objective of this approach was to provide complete and consistent content so that similarities and differences would be easily identified among all DOTs.

The following sections provide brief summaries of each agency presentation. The complete presentations are provided at the SharePoint site noted previously.

## **FLORIDA DOT R09 IMPLEMENTATION**

Florida has been working with risk management concepts for some time. Initial steps included FHWA major project cost estimate reviews, planning and hosting FHWA risk management R09 training, conducting pilot R09 workshops , developing a risk management practice, and establishing a statewide risk management team.

The team has gradually developed—and is still developing—in structure and program. Some current components of the team and their activities include:

- Membership (Regional Teams) in each District (District Value Engineer, District Estimates Engineer,
- Design Project Manager, Construction Project Manager).
- Monthly teleconferences between the statewide risk management team and Regional Teams.
- Identifying projects and coordinate schedules for workshops.
- Supporting workshops with staff and facilities.
- Gradually changing culture by promoting risk management.
- Provide training and best practices/lessons learned to the Regional Teams.

At present, Florida DOT uses a formal procedure to select the level of effort and the tool for risk management analysis. The following outlines that procedure:

- Complex project or total project cost greater than \$500M – Consultant-led Independent Risk Analysis Workshop that complies with the FHWA Cost Estimate Review process.
- Total project cost between \$100M and \$500M – Risk Analysis Workshop using commercial risk modeling program.
- Projects not requiring a formal workshop – Florida DOT Risk Analysis Modeling Tool.
- Qualitative risk analysis – Risk-Based Graded Approach Worksheet.
- SHRP2 R09 Risk Management Tool. It is anticipated that this tool will be used to support small workshops (\$200 million in cost or less) and projects not requiring workshops.

The presenters then provided a summary of Florida's R09 implementation.

### **Florida DOT Completed R09 Implementation Activities**

- October 2013 – Demonstration Workshop on Pinellas County Gateway Expressway project located in the Tampa-St. Petersburg area, which exposed project team and subject matter experts to R09 process in combination with a full probabilistic risk assessment.
- June 2014 – acquired risk analysis software for Florida DOT Districts and Central Office.
- August 2014- Conducted R09 Training for Risk Workshop Facilitators to train Florida DOT staff to lead/facilitate risk management meetings/workshops using the R09 process.
- February 2015 – Demonstration Workshop on Pinellas County Gateway Expressway project to update risk assessment/analysis from the October 2013 workshop.
- August 2016 – Training for Risk Workshop Facilitators that included a revamped course and new and enhanced R09 risk template with user's manual.

### **Florida DOT Future R09 Implementation Activities**

- Prepare and conduct internal computer-based risk management trainings.
- Purchase risk repository system/software and conduct internal training.
- Incorporate risk analysis/management into Florida DOT's policies:
  - Process for Risk-Based Contingency management in place and currently being used.
  - Next step: Development of a Formal Risk Management Policy.
- Technical assistance from FHWA:
  - Develop performance measures (project, program, and risk management measures).
  - Evaluate Program Effectiveness (current Florida DOT risk management program and SHRP2 R09 implementation).
- Enhance Florida DOT Legacy Systems to support the Florida DOT Base Cost Analysis.

Mr. Greg Davis of Florida DOT showed the R09 workshop results from the Pinellas County Gateway Expressway project. Two R09 workshops were conducted in October 2013 and February 2015, primarily due to project changes which occurred during the approximately 18-month period and to update risk inputs from the October 2013 workshop. A proprietary probabilistic software product was used in combination with the R09 Template for both workshops, as requested by Florida DOT. Base, Unmitigated, and Mitigated project performance results were presented, and the 70th and 90th percentile confidence level numbers were highlighted during the presentation. The intent was to show typical results from the workshops and not to dwell on actual results.

Finally, a summary of the Florida DOT Delphi approach used for all risk management studies was outlined as follows:

- Florida DOT risk assessment approach is very similar to the SHRP2 R09 approach.
- The risk assessment project team includes the project manager, design team, and subject matter experts.
- Utilize a risk starter list.
- Agenda format provides risk discussion by disciplines.
- Use quantification assessment of risk using direct values.
- Develop consensus on quantification of risk.
- Mitigation strategies are included in the analysis.

## **Q&A during Florida DOT's presentation**

The following questions were asked by the peer exchange participants during Florida DOT's presentation:

### **Q: Projects with 10 percent or more contingency need a risk assessment; how much cash has been reallocated as a result?**

A: Data was not available at the time of the peer exchange. According to the Risk-Based Contingency procedure, projects with more than a 15 percent contingency will require a risk assessment to justify the contingency amount.

### **Q: When do you recommend risk workshops be conducted?**

A: Early in the process, before project design. An initial workshop before the National Environmental Policy Act (NEPA) approval, and a second one before the beginning of construction phase.

### **Q: What is the status of the Pinellas County Gateway Expressway project?**

A: The current scope of work has increased compared to the scope used during the workshops conducted in October 2013 and February 2015, but the project is scheduled for letting in a few months.

### **Q: How are you addressing risk management program obstacles?**

A: The Statewide Risk Management Team (SRMT) is struggling with obstacles mentioned earlier. In general, if the SRMT can get the project team to agree to hold a workshop, they will see the value in the process. However, there is still an obstacle from the project team's management with resources needed for the workshops.

A: The SRMT is learning to take "baby steps" with changing the culture. Some consultants, on their projects, are asking for risk workshops. The SRMT will continue to demonstrate the benefits of risk management as good project management. Also, the SRMT needs to "sell" benefit/cost value to upper management.

### **Q: Can you clarify what size projects risk workshops are conducted for?**

A: Risk Workshops are held for projects greater than \$100 million dollars of total project cost (including all support cost such as R/W, CEI, Design, etc.). For projects under \$100M, the risk

assessment is done using Florida DOT Self Modeling tool which does not require a formal workshop.

**Q: What is the cost to use consultants to conduct risk assessment workshops?**

A: \$60,000 to \$70,000 for an initial workshop; \$40,000 for follow-up workshops. A specific answer to this question was not available at the time of the peer exchange. One of the things FDOT is interested in identifying is the return on investment they get from applying risk management on their projects, which is one of the remaining R09 technical assistance activities.

**Q: Wisconsin DOT asked about the background slide. For complex \$100-500M projects, workshops are held. Are you implementing this criteria on all projects?**

A: It is recommended to conduct risk workshops on projects from \$100M to \$500M and it is required for greater than \$500M (to meet FHWA Major Project requirements). Smaller projects receive some risk assessment from different tools such as FDOT's Risk Analysis Self Modeling tool, which uses Monte Carlo analysis and generates a risk register. In the R09 tool, mean value is used for the risk assessment as oppose to the 70<sup>th</sup> percentile value in the Monte Carlo analysis.

## **OREGON DOT R09 IMPLEMENTATION**

Oregon DOT's presentation was pre-recorded since they could not participate in the peer exchange in person. However, Ms. Lea Ann Hart-Chambers of Oregon DOT prepared an excellent prerecorded presentation. Oregon's interest in risk is based on successful targeted use for specific projects and the potential for appropriate use on the Oregon DOT Transportation Investment Act III State Bridge Program. Oregon DOT's **primary desired objective** is to streamline project delivery by including a formalized risk management process.

### **Oregon DOT Completed R09 Implementation Activities**

A key implementation step to success for Oregon included a one-day briefing/workshop for Oregon DOT upper management. This workshop, which was championed by Oregon DOT's Technical Manager and Chief Engineer, was conducted immediately after the first R09 demonstration workshop on August 21, 2014. The workshop included the following sessions:

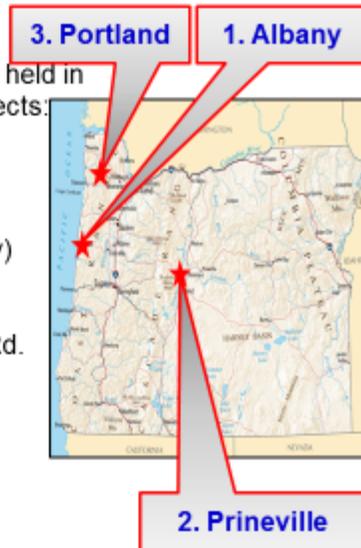
- Overview of SHRP2 Program and benefits of the R09 risk management process.
- Results of previously conducted R09 demonstration workshops in other states.
- Results of the first Oregon R09 workshop.
- Results of Oregon DOT R09 self-assessment survey.
- Next steps for Oregon R09 implementation.

Oregon DOT also provided an overview of the three R09 demonstration workshops conducted to date (see **Figure 2**).

## Overview of Demonstrations

Three demonstration workshops have been held in different areas of the State on different projects:

1. I-5: S. Jefferson-Murder Creek Section  
August 19 and 20, 2014
2. Ochoco Creek Bridge (Paulina Highway)  
November 18 and 19, 2014
3. US 26: NW 18th St. – Cornelius Pass Rd.  
25 and 26 February, 2015



**Figure 2. Illustration map and text description of the Oregon R09 demonstration workshops**

Ms. Hart-Chambers then provided a summary of each workshop in terms of participants, the completed risk register, risk severity rankings, unmitigated project performance, and the final mitigated predicted project performance at the time of the workshop. For the project used on the second R09 workshop, a time lapse video of the Ochoco Creek Bridge project was shared during the presentation, as well as a comparison between the workshop information and the current contract amounts.

A summary of the Oregon DOT R09 demonstration workshops indicated:

- Discussions were of high value
- Better than Oregon DOT's current state of practice:
  - Development of Risk registers
  - Documentation of cost and schedule impacts
  - Development of mitigation strategies
- Opportunities identified
- Easy to incorporate in the project development process
- Power of engaging project stakeholders with trade-offs
- Disruption analysis was found beneficial
- Opportunity to incorporate community solutions and ideas (partnering).

Finally, Oregon DOT presented information regarding what is needed for a successful risk management implementation. These included capitalizing on the agency's focus on

streamlining, creating a tiered approach to risk management (due to project variation and diversity), engaging with Oregon DOT leadership early, and recognizing the most promising project threats and opportunities and documenting results. At Oregon DOT, the risk management framework is a companion to the Scope & Select Framework. It supports and provides support and guidance for the appropriate integration of risk within the Scope & Select Framework Documents. The Risk Management Framework includes a tiered assessment of projects, required and optional tools for projects, and an advisory for local agency projects to which risk management has been included. A copy of the Local Agency Risk Management Advisory was provided and is included in the peer exchange reference materials.

### **Oregon DOT Future R09 Implementation Activities**

- Future implementation plans for Oregon include the development of a tailored R09 template which better matches the DOT's policies and procedures. Oregon is looking into ways to simplify and streamline the R09 tool inputs. These include drop downs for most common risks, linking the scheduling tool analysis potentially to the R09 tool. Oregon is also researching to see whether project cost estimating at design milestones can be leveraged.
- To grow a culture that not only discusses but documents project risks, Oregon is providing staff with risk registers that can be used during development of less complex projects.

### **Q&A during Oregon DOT's presentation**

Because Ms. Hart-Chambers was not in attendance, Mr. Carlos Figueroa of FHWA responded to the questions.

#### **Q: Are there any recommendations Oregon can provide regarding the R09 Template simplification? Any follow-up?**

A: Oregon is adding more drop-down menus and adding specific Oregon overhead rates to reflect Oregon DOT's needs, among other changes.

#### **Q: Is ARA working with Oregon DOT to update the R09 tool?**

A: Yes, Oregon DOT is looking to update the R09 tool with new drop-down menus and turning off some features of the analysis, among other changes. Since this is an open source template, each State can build in their own ideas. The comments on simplifying or modifying the R09 template have merit. FHWA is open to changes to advance the state of practice to incorporate the R09 template.

## **PENNSYLVANIA DOT R09 IMPLEMENTATION**

The Pennsylvania DOT (PennDOT) is currently establishing a risk management program, as part of the R09 implementation. They have developed a statewide team, created “success and failure factors,” and are developing a policy that incorporates risk management into the project delivery process. As presented by Mr. Brian Shunk, a summary of their risk management program approach follows:

### **PennDOT Completed R09 Implementation Activities**

1. Received R09 Grant award
2. Demonstration Workshop #1 – District 2, Potters Mills Gap Project
3. Initial Train-the-Facilitator Training
4. Formation of Statewide Team
5. Statewide Team-Facilitator Training
6. Developed draft Policy Framework and Implementation Strategy
7. Delivered an Executive briefing to PennDOT Management
8. Demonstration Workshop #2 – District 5, Cementon Bridge Replacement Project

### **PennDOT Future R09 Implementation Activities**

- Finalize Implementation Strategy and Policy.
- Develop PennDOT’s internal Risk Management Training materials.
- Conduct Initial Risk Management Training, which will be followed by additional training sessions throughout the state (all districts).

Through PennDOT’s risk management experience to date they have developed a useful summary of success factors and failure factors, which are summarized below.

### **Risk Management Project Success Factors**

- Communication at every stage of development to ensure buy-in, benefits; talking to stakeholders.
- Show that the value of the benefits more than offsets the extra work put into risk management.
- Project team participation/ownership in the process.
- Promote organization/thoroughness through risk management which can help make sure steps or stakeholders are not overlooked in a project (e.g., emergency services).
- Final products of risk management (templates/tools/policies/procedures): ease of application.
- Deliver Training to continue building risk management capacity.

## Risk Management Project Failure Factors

- No implementation plan/approach is developed.
- Policy fails to clarify the benefits at the District level; not just an exercise, but make risk management an integral part of project management.
- Need top-down buy-in and follow through (staying power); failure to “stick with it.”
- Products/tools/processes are not scaled to project types.
- No support for initial risk management step (identify risks) to start a list and build throughout project development.

PennDOT also shared a summary of their draft Risk Management Policy. Perhaps most notable in their presentation is the “Value to Pennsylvania” statements used to secure policy approval, acceptance, and use. The value of risk management to Pennsylvania at the Statewide and Project levels is included below. Furthermore, **Table 1** illustrates PennDOT’s Risk Management Tiered Approach based on project complexity and cost estimate.

### Statewide Level

- Integrates risk identification with initial project planning (early is better).
- Strengthens risk-related communication between planning partners and Districts.
- Helps set appropriate project-level budgets, milestones, and contingencies.
- Allows better predictability for cash flow needs, balance of let dates, and maintenance of State Transportation Improvement Plan (STIP).
- Enhances fiscal management, specifically in the following phases:
  - Planning
  - Design
  - Construction

### Project Level

- Enhances project team communication around risk identification and monitoring.
- Improves project performance (budget, milestones, public satisfaction) by anticipating and managing risks.
- Expands project team understanding with fewer surprises.
- Enhances project management and risk management culture.

**Table 1- PennDOT Risk Management Tiered Approach**

Risk Mgt. Level	Complexity*	Project Cost (all phases)	Risk Strategy and Tools	Risk Manager
1	Non-complex	<=\$5M	Level 1 Register Recommended	Project Manager
		\$5M-10M	Level 1 Register	Project Manager
	Moderately Complex	<=\$10M	Register, <b>Qualitative</b> Analysis, Risk Response	Project Manager
	Resurfacing or preventive maintenance	<=\$30M	Level 1 Register Recommended	Project Manager
		>\$30M	Level 1 Register	Project Manager
2	Non-complex	>=\$10M	Register, <b>Qualitative w/ Impacts</b> Analysis, Risk Response	Project Manager
	Moderately Complex	>\$10M to \$100M	Register, <b>Quantitative</b> Analysis, Risk Response	Project Manager
3	Most Complex	<=\$25M	Register, <b>Quantitative</b> Analysis, Risk Response  Risk Management Plan (recommended)	Project Manager
		>\$25M to \$100M	Register, <b>Quantitative</b> Analysis, Risk Response  Risk Management Plan	Assign a Risk Manager or establish assistance within project team
		>\$100M	Conduct Risk Workshop  Register, <b>Quantitative</b> Analysis, Risk Response  Risk Management Plan	-Assign Risk Manager -Consider scope of work for consultant to conduct the risk management workshop -Establish Risk Management Team

**Q&A during PennDOT’s presentation**

**Q: Why use consultants when applying the R09 model?**

A: The time commitment for this work is not time most project managers have. This includes time to develop initial R09 expertise; and the time project managers will need to maintain and manage the risk register as the project further develops.

**Q: Why/how did PennDOT select the Caltrans risk management tool/suite?**

A: The DOT's consultant analyzed different State DOT tools (four or five) and presented the findings to PennDOT. The DOT wanted something that was scalable; Caltrans "flowed" to the top.

**Q: For which projects will you use consultants to conduct risk management?**

A: For those projects with many risks, those that will use the R09 tool, as identified in the policy.

**Q: Looking at the *Phased Roll-Out* slide, looks like it will take 3 to 4 years to get up to speed with risk management. How do you explain this time period demonstrating value?**

A: Original schedule was more aggressive; senior management directed to spread out over a longer period. It involves re-training of staff, and breaking habits of 25+ year staff doing it another way. The idea is to capture as many risks as possible on the project to reduce scope changes and change orders.

**Q: Please provide a summary of PennDOT's experience with the R09 Tool.**

A: PennDOT is using a consultant to implement the R09 tool. We consider the follow through on risks and implementation to be very important. We have included the R09 process into our draft risk management policy along with other processes. We began with a R09 Demonstration workshop and had a pause in our efforts for 18 months before starting back up with R09 implementation tasks. We have some concern that the R09 tool will need future maintenance support. We anticipate using a consultant and the R09 Tool approximately **10 times per year**.

**Q: Why do you need an "Excel consultant"?**

A: PennDOT staff still does not have time to pre-load the R09 tool. Updating is possible. PennDOT uses internal expert knowledge to do this work. PennDOT is using the consultants only for the R09 projects and not for the regular type projects that the Caltrans model works well on.

**Q: PennDOT is using a 4- to 5-year rollout for the culture change to adopt risk management in their department. What are the results, and is this timeframe defensible?**

A: Yes, we think it is. It was adopted from the top to take more time to implement, which works for PennDOT.

## **MINNESOTA DOT R09 IMPLEMENTATION**

The Minnesota DOT (MnDOT) presented their experience with R09, beginning with a background on their previous work with risk management.

Risk management has been used on larger, complex projects since 2010. The initial focus was on bridge projects using Chapter 152 funding, using qualitative analysis. Examples include Lafayette Bridge (US 52) replacement, St. Croix Bridge (MN 36) replacement, Dresbach Bridge (I-90) replacement, and Winona Bridge (MN 43) replacement.

In 2013, the Minnesota legislature passed Corridors of Commerce funding for construction, reconstruction, and improvement of commerce-friendly trunk highways. Risk management was part of project management and in developing a risk-based cost estimate using quantitative analysis.

Today, MnDOT sees value in identifying, analyzing, and managing risk on **all** projects using a more quantitative analysis process to:

- Help with scope and project budget
- Help with overall project management

Ms. Jennie Read briefly described the R09 Demonstration Workshop on the I-694 project details and risk management results. This information is further addressed in her peer exchange presentation. Based on Minnesota's considerable experience with risk management, they encountered and resolved several obstacles. They also have learned some valuable lessons, which are included below.

### **Obstacles to Risk Management at MnDOT**

- Getting project managers on board with formally identifying, analyzing, and managing risks for all MnDOT projects.
- Getting project managers to treat the risk register as a living document that needs to be updated.
- Helping project managers understand that risk management is a tool in good project management practices, and not a term that means they've done something wrong.

### **Solutions to Overcome Obstacles**

- Continue working with project managers on filling out risk registers.
- Communicate with project managers and emphasize how risk management has benefitted other projects.
- Continue working with Department leadership to ensure leadership continues championing the effort.

## Lessons Learned and Advancing Risk Management at MnDOT

- Support from leadership/upper management is critical. Currently MnDOT leadership/upper management supports risk management. However, having a vocal champion who communicates regularly with project managers and middle management would help keep risk management in the front.
- Building experience and expertise in risk management is important, specifically:
  - Working with project managers and other customers in getting comfortable with basics of documenting risk on a risk register and communicating risks, and
  - Getting project teams to understand risk is not always bad, and “risk” is not a bad word. Identifying, analyzing, and managing risk is an important part of good project management.

### Q&A during Minnesota DOT’s presentation

#### **Q: Who facilitates MnDOT’s risk workshops?**

A: For more complex projects MnDOT uses consultants. Other projects are facilitated by Jennie Read, Cost Management Engineer and Eric Janssen, MnDOT Independent Cost Estimator. MnDOT uses risk management to establish project budgets; the current focus is on fiscal year 2017 (now). Risk management is performed as projects finish scoping, before inserting them into the STIP for budget purposes (driven by Minnesota Legislature and performance measures).

#### **Q: Who participates in MnDOT’s risk workshops? Are they diverse?**

A: MnDOT tries to assemble a diverse team as possible, but MnDOT is under time constraints for budgeting/STIP purposes.

#### **Q: Since executive management supports MnDOT’s risk management efforts, is there a formal policy for implementation?**

A: Not currently, but guidance is being prepared/planned. For now, only Jennie and Eric are working on risk management, so development of guidance may be delayed.

#### **Q: The R09 tool uses a mean value approach. What probability do you use?**

A: P70 reliability is typical, but there is a debate within MnDOT and some argue for P90.

#### **Q: With no guidance, how does MnDOT control what tools are used?**

A: Draft guidance has been developed. Jennie provides advice/guidance to project managers and assists with workshops.

#### **Q: Please expand on why MnDOT is doing risk management the way they are?**

A: Project cost is pushing risk management at MnDOT due to cost overruns on prior projects. Ultimately, MnDOT wants realistic budgets—not over, not under. It helps manage project scope. Once budget is established, there is a need to work within.

**Q: Does MnDOT use mitigated or unmitigated estimate?**

A: MnDOT uses just unmitigated analysis at this time. Internally, some would like to go to mitigated analysis. If different projects results occur later, then it is treated as a new project (e.g., bridge rehab becomes a bridge replacement). The risk of becoming a replacement is analyzed using a Monte Carlo simulation analysis.

**Q: Are risk registers maintained?**

A: Not generally. Some project managers may go back and look at them. Performance Management criteria was legislatively mandated for costs and budget. There is an existing risk management process in place utilizing Monte Carlo simulations. It is suggested that you need a team approach to risk management and not to rely solely on the project manager.

There is a need to focus on risk registers, risk analysis, and normalizing these into existing programs. MnDOT's complex projects can be quite small in nature, as described in the [SHRP2 R10- Complex Project Management product](#).

MnDOT uses risk management on \$10M and larger projects. MnDOT will use consultants for projects of \$25M in costs and larger. MnDOT has adopted the Texas DOT risk register format (spreadsheet) and uses this on routine projects. MnDOT indicated that they need STIP project budgets now and cannot wait to implement process over 4-5 years.

Eric Janssen, MnDOT Independent Cost Estimator, commented that during this first year, there is probability versus uncertainty confusion. Project managers have higher confidence in the certainty of cost/quantity estimates.

Sharon Bremser, from Wisconsin DOT, commented that Wisconsin DOT is struggling with the same issues; there is a hesitation to change estimates. Wisconsin DOT tries to do risk analysis twice per year. Wisconsin DOT needs to remind workshop participants that the risk analysis was just at a point in time. Wisconsin DOT promotes that it is acceptable to change the analysis as more information becomes known.

**Q: Are workshops multi-disciplinary?**

A: No, many of these workshops are handled by Eric and Jennie alone, but a group would be preferable.

**Q: In the use of R09 and Monte Carlo models the question of what probability number to use came up.**

A: The range is P50 to P90. However, P70 seems to be a good compromise.

**Q: How does MnDOT distinguish which process to use?**

A: Under \$10M projects use simple risk modeling.

**Q: Do you have metrics to show benefits?**

A: No, just showing MnDOT staff that risk management helps them in the project development.

**Q: What were the results of change orders in the pilot projects?**

A: There is no data to answer this. Risk affects multiple phases, and you need to redefine these into additional separate risks.

**UPDATE ON R09 TEMPLATE, USER’S MANUAL, EQUATIONS SHEET, AND RISK WORKSHOP FACILITATOR TRAINING**

Mr. DiMaggio provided an overview presentation of the current version of the R09 template. Several of the agencies participating in the peer exchange have not been exposed to the new open source Excel risk management template and the updated Risk Workshop Facilitator Training. Unfortunately, some of the early R09 implementation deployment activities were conducted using the SHRP2 research phase products. The current R09 template and training have been completely redeveloped and updated since the end of the SHRP2 research phase.

The objectives of this overview presentation were to highlight key steps of the R09 risk management process, outline the R09 risk management template steps and related forms, outline the content of the 100-page template user’s manual and associated help files, and explain template results and project report options. The current version of the R09 template and example problem were included on the flash drives provided to the peer exchange participants. This version of the R09 template addresses all previously identified error messages and needed updates.

Mr. DiMaggio stressed that the R09 template was developed to be completely transparent and not a “black box” computer tool, informative, relatively easy to use and understood by transportation staff. In addition, this template is an open source tool which could be tailored by individual transportation agencies based on their specific needs, culture, and organizational structure.

The new R09 Template has a Graphical User Interface (GUI) to facilitate data entry. It also has capabilities for producing summary tables for each of the steps of the process and includes a Help Menu and pop up messages to facilitate understanding of the process.

**Q&A during Update on R09 Template, User’s Manual, Equations Sheet, and Facilitator Training presentation**

**Q: What is the definition of lag?**

A: This is related to the scheduling Critical Path Method. [From the project structuring help guide: “Lag is defined as the minimum necessary amount of time between the finish (or start) of one activity (and) prior to the finish (or start) of a succeeding activity in a project development activity sequence. It may be a positive or negative number. Lag times are defined by reference to the type or relationship being utilized (Start to Start, Start to Finish, Finish to Finish, or Finish to Start) and are defined from the perspective of a preceding activity’s logic to one of its successors.”]

**Q: Is lag a “hard coded,” restraining schedule?**

A: Yes, although “hard wired” is probably not the best term since it is a user input number in the template.

**Q: Why input Disruption data, when the purpose of risk management is to identify these risks?**

A: To be able to analyze options/make informed choices.

**Q: What happens if a risk affects multiple phases of the project?**

A: The user needs to include a uniquely defined risk/explanation for each affected phase.

## **DAY 1 CLOSING REMARKS AND INSTRUCTIONS FOR DAY 2**

Mr. Chesnik provided a brief summary of several key points which were highlighted during the first day of the peer exchange:

- Introductions by Mr. Blanchard, Mr. Platte, and Mr. Figueroa. The collective messages clearly showed leadership support for R09 and risk management techniques.
- Mr. DiMaggio and Mr. Chesnik synthesized and presented the state of practice for the last 4 years of R09 risk management.
- Mr. Davis’s presentation showed the level of effort and risk management results from many Florida projects.
- Oregon’s video by Ms. Hart-Chambers clearly showed that she is a true champion of risk management using the R09 tools. The three demonstration workshop projects illustrated the application of the R09 tool to different project types and sizes. Also addressed during the presentation was Oregon’s Risk management framework which includes a tiered assessment of projects and tools required and optional for projects. Finally, the development and implementation of a Local agency advisory which includes risk management was very informative.
- Mr. Shunk’s presentation showed that PennDOT has recently developed a very detailed risk management policy which has been carefully developed and thoroughly reviewed. The new policy is accompanied by a comprehensive statewide implementation plan to train staff, advance a progressive roll-out to State staff, and document their existing processes and pilot project results.
- The MnDOT presentation indicated that they are very invested in consultant support of risk management on many projects through the use of Monte Carlos simulation tools. MnDOT will not be adopting the R09 risk management tool.

## ARIZONA DOT R09 IMPLEMENTATION

Mr. Madhu Reddy, Arizona DOT Phoenix District Engineer, explained that Arizona DOT currently performs risk analysis on select projects. Arizona DOT and the Maricopa Association of Governments (MAG) jointly perform cost/risk assessment workshops. In addition, Arizona DOT performs value engineering studies on some projects based on:

- Facility type
- Project size
- Project scope
- Funding source
- Project complexity

Figure 3 summarizes the Arizona DOT/MAG cost risk assessment process.

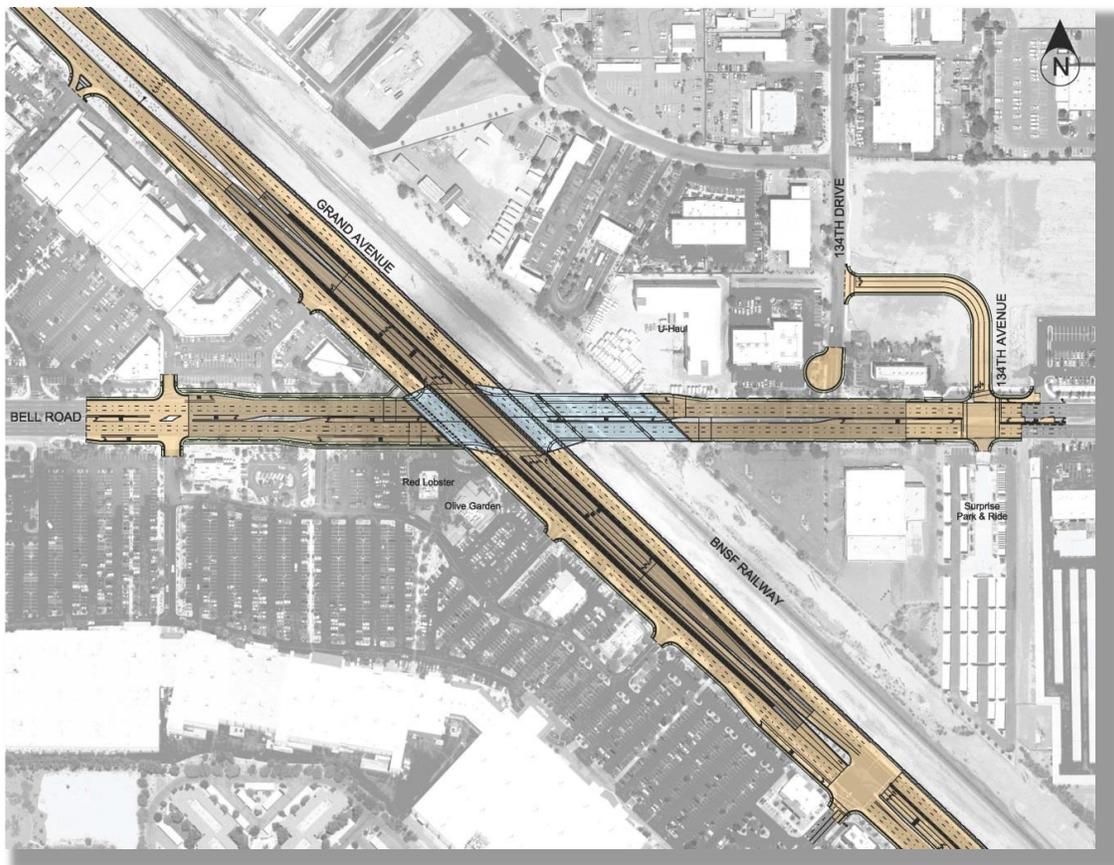


Figure 3. Arizona DOT/MAG cost risk assessment process.

The R09 Demonstration Workshop project selected by Arizona DOT was the development of a new interchange at US-60 and Bell Road in the City of Surprise. This project was selected based on its many complexities: existence of railroad track, many and significant business impacts, political sensitivity, several necessary complex utility relocations, constrained right-of-way, and heavy traffic congestion within the City of Surprise. Figure 4 shows an aerial view of the project.

Following the workshop, a very proactive approach was implemented by several key members of the project team to minimize or eliminate the high-priority threats and optimize the greatest potential opportunities. The actions associated with these risks are summarized below:

- Coordinated early with utility companies to initiate their design.
- Procured large utility poles early.
- Worked with the City to allow summertime closure of Bell Road.
- Coordinated with utilities to schedule some relocations prior to the start of the project.
- Developed a request for proposals to allow for innovation (alternative technical concepts).
- Allowed for alternative technical concepts and one-on-one bidder meetings.
- Performed some utility potholing prior to procurement.
- Implemented an extensive public relations campaign to alert the public and businesses of the full Bell Road closure and other construction activities.
- Suggested alternate routes.
- The full closure of Bell Road eliminated the need for a temporary crossing.



**Figure 4. Aerial view of Bell Road and US60, Surprise, Arizona.**

Since the December 2014 workshop the project has advanced significantly and is nearing the completion of construction, which is scheduled for February 2017. This schedule fortunately permitted the development of a post-construction project assessment to compare the 2014 risk workshop predicted performance with post-construction results. The risk management results from the Bell Road US60 project are positive (significant benefit to cost comparison can be demonstrated), and Arizona DOT views this project as a very successful experience.

### **Additional Comments from Arizona DOT**

- Arizona DOT has conducted 35 workshops which saved approximately \$500M, mostly environmental savings. These results are programed as savings in the Transportation Improvement Program (TIP) as unmitigated costs.
- There have been business claims for damages and lost revenue. This was noted in the risk registers developed but yet was a surprise, as no dollar levels were assigned.
- All project risk studies were done using a Monte Carlo simulation model and by a consultant that the MPO selected. These studies did not use the R09 template process.
- The savings were used to fund additional projects.
- The 35 projects were funded out of the \$2B program and the savings represented 40 percent of a \$500M scope of work where project contingencies were removed following the completion of risk management studies.
- Arizona DOT does not currently have a risk management policy. The 35 projects would be funded by a ½ cent sales tax increase.

### **Risk Management Program Level Obstacles**

- Lack of personnel and their current heavy workload.
- Commitment from all team members.
- Ability to update and maintain risk registers.
- Ability to develop reports for management utilization.
- Identify project stages to conduct risk management (Planning – Scoping – Design).
- Determine a project selection evaluation criteria

### **Risk Management Lessons Learned**

- Potential gains for initiating SHRP2 R09 process earlier in the project development.
- Mandatory workshop attendance by representatives from each technical group.
- Significant effort and time required to mitigate identified risks. This may not fit with schedule commitments (funding, political, etc.).
- The process benefited on the US-60/Bell Rd Interchange project from an experienced team that attended the workshop.
- Risk Analysis has been very beneficial to the Department in all aspects (Budget, Scoping, Duration, Clearances, Acquisitions, etc.).
- Risk Analysis should be included as part of the project development process.
- Risk Analysis is beneficial for all projects and has to be completed during early stages of the project (30% or 60%).

## PUERTO RICO HIGHWAY & TRANSPORTATION AUTHORITY R09 IMPLEMENTATION

Ms. Migdalia Carrión presented a summary of the Puerto Rico Highway and Transportation Authority's (PRHTA) history with the R09 tools; see **Figure 5**.



**Figure 5. PRHTA steps and schedule for implementing R09.**

The selected PRHTA R09 Demonstration Project was the replacement of Bridge No. 702 over the Tiburones Channel in the municipality of Arecibo. This project although small, but was selected based on the many similar complexities it has, compared to a complex project (utility relocation, significant congestion, deteriorating facility, significant environmental issues, and a very active community). The final design and construction of the project has been delayed for various reasons, including funding, but PRHTA plans to implement the R09 demonstration workshop results as the project moves forward.

### PRHTA Completed R09 Implementation Activities

- R09 Demonstration Workshop on Bridge 702 over Tiburones Channel in Arecibo
- R09 Facilitator Training

### Lessons learned from the PRHTA R09 experience

- The importance of having a detailed assessment of the project conditions (at least at a conceptual design).
- Have a team committed and with adequate experience to obtain good results.
- Change staff's mentality from the current perception that risk analysis is difficult and that it is a time-consuming process.
- R09 is a good tool to anticipate and plan for potential issues and opportunities and is applicable to any project type and size.

- Due to PRHTA’s experience on the Bridge 702 replacement project, the agency learned that in every project there is a possibility that the design consultant or other key stakeholder might have issues that require them to withdraw from the project.

### **Additional Comments from PRHTA**

- An environmental statement has not been completed on the Bridge 702 replacement project. Therefore, it is still considered a risk.
- The initial design consultant went out of business, and a new request for proposals has been issued to select a new consultant.
- Although the costs of a consultant’s failure to complete a project would always be a risk, it would be considered to have a very low probability of occurrence but a high cost and high duration impacts.
- The request for proposals for the new design consultant considered the risks documented in the R09 workshop.
- Consultant agreements can have language to address consultant related risks such as requiring bid bonds to help mitigate this type of risk.

### **PRHTA Future R09 Implementation Activities**

- PRHTA will develop and begin applying a policy to establish the R09 simplified risk management process.
- For successfully implementing this risk management process, PRHTA may need additional resources within the organization, to assist with these needs.

## **FHWA FEDERAL LANDS HIGHWAY DIVISION R09 IMPLEMENTATION**

FHWA Federal Lands Highway Division (FLHD) has used risk management concepts and tools for some time, and the process has progressively evolved. The current general program and project approach for FLHD varies by project size and complexity but may be summarized as follows:

- Program risk management tools:
  - Brainstorming
  - Scenario planning
  - Qualitative risk assessment techniques
  - Mitigation plans
- Project risk management tools:
  - Qualitative risk assessment techniques.
    - Use of risk registers and mitigation strategies
  - Very proactive in managing schedules and budgets
    - Earned value is used, schedules are developed using the critical path method, and change control process is also used.
  - Frequent cross functional team communication

- FLHD is generally risk tolerant.

The selected project for the R09 Demonstration Workshop, although not unusual for FLHD, was somewhat unique for a transportation agency. Nonetheless, the Monterey Bay Sanctuary Scenic Trail – Segment 5, Phase 1 (**Figure 6**) project was chosen based on its complexities, as summarized below:

- Located in Santa Cruz County, California.
- Consists of 5.2 miles of new pedestrian and cyclist trail:
  - 12 feet paved surface
  - 8 feet crusher fine surface
- Primary project partners:
  - Santa Cruz County Regional Transportation Commission
  - California State Parks
- Other stakeholders:
  - Santa Cruz County Department of Public Works
  - Agricultural community
  - Public interest groups
  - Iowa Pacific Railroad
  - California Coastal Commission
  - California Coastal Conservancy



**Figure 6. Overall Monterey Bay Sanctuary scenic trails network.**

The final design and construction phases of the project has not yet begun. However, the results of the R09 workshop are being applied by the project team as it moves forward.

Mr. James Herlyck and Mr. Doug Smith discussed the anticipated obstacles and lessons learned from the R09 experience, summarized below.

### **Risk Management Project Level Obstacles**

- Assigning cost and time impacts to risks. For example, would the delay to schedule be 6 months or 9 months?
- Assigning probabilities to risks. For example, is the probability of not finding a mitigation site 30 percent or 50 percent?
- Limitations of “silo” constrained analysis: Recognize that a strategy applied to a single risk may also affect another risk.
- Risks change over time:
  - Perceived low risks can become high risks.
  - New risks appear during the project life cycle.
- Two previously unknown risks have substantially delayed the project.

### **Risk Management Program Level Obstacles**

- Constant monitoring is important
- Frequent cross functional team communication is needed
- Frequent partner communication is needed
- Discussion of risks and strategies was the most valuable time spent
- Interaction between all disciplines (geotechnical, environment, highway design, project management, etc.) is key.
- A risk event in one discipline often impacts other disciplines
- A cross functional approach to delivery is important beyond risk management
- Risk management tools and processes should be scalable
- Size of project (cost or scope) is not the only indicator

### **Q&A during FHWA Federal Lands Highway Division’s presentation**

**Q: Who uses the software of R09?**

A: Internal staff.

**Q: How do you deal with R09 moving forward?**

A: It is at the project manager level for tool selection. Exposure to others will move the tool along. No formal policy to promote use.

**Q: How do you handle cascading risks?**

A: You can model cascading risks by adding more risks in the risk register.

**Q: Are there performance models available?**

A: No, there are not.

**Q: Is upper leadership buying into risk management?**

A: Yes, but these are challenging conversations.

## **WISCONSIN DOT R09 IMPLEMENTATION**

Ms. Sharon Bremser and Mr. Frank Pritzlaff of Wisconsin DOT provided a summary of their recent experience with developing and applying improved project and risk management tools:

- 2012 – Risk-based estimates – Type 1 project – Monte Carlo simulation.
  - <http://wisconsin.gov/Pages/doing-bus/eng-consultants/cnslt-rsrcs/rdwy/mega.aspx>.
- 2015 – Adopted Strategies for Managing Complex Projects (SHRP2 R10).
- 2017 – Incorporating risk into masterworks system for project life cycle.
  - Provide risk register analysis.
  - Provide risk cost and schedule adjustments to be added as needed through time.

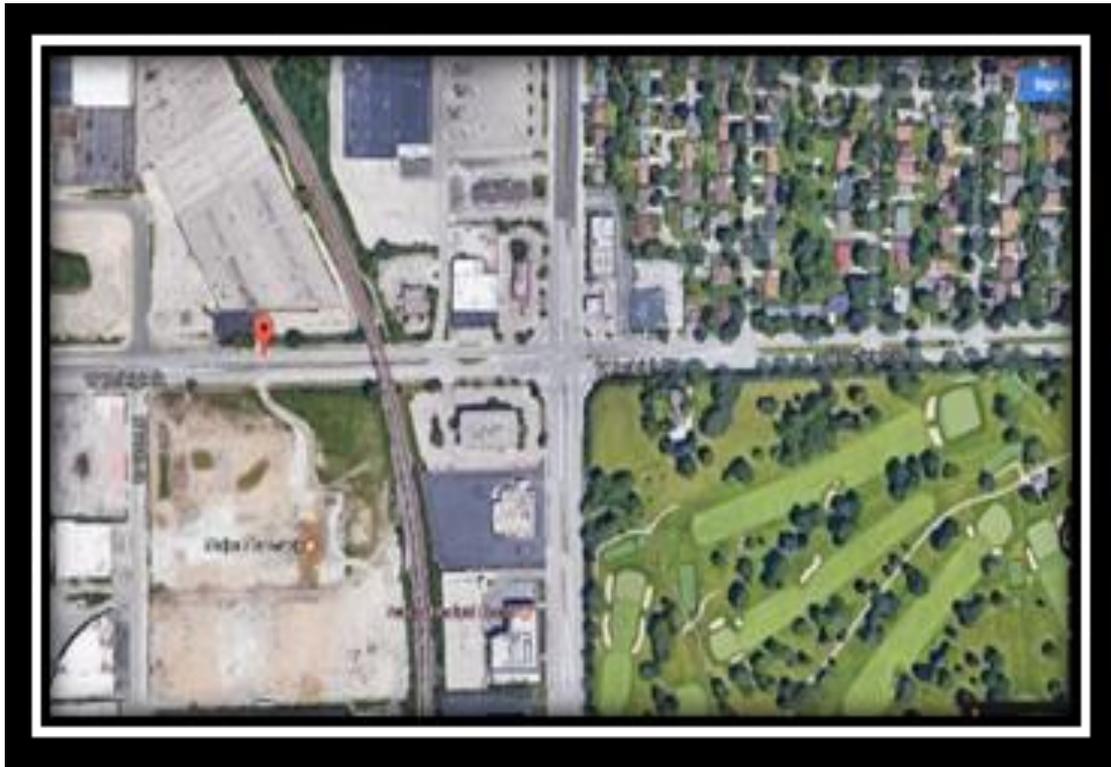
Wisconsin DOT hosted both an R09 Demonstration Workshop and the Facilitator Training. The demonstration project has many of the complexities of a typical urban transportation project, as summarized below:

- 11-mile corridor study of STH 100 in the City of Wauwatosa, WI
- Deficiencies:
  - Excessive traffic: current average daily traffic is 30,000 vehicles per day
  - Capacity: six-lane State trunk urban arterial
  - Safety: seven times more crashes than the statewide average
  - Diversion: will be used as diversion route for the reconstruction of I-894
- Alternatives:
  - Provide either level of service (LOS) D or LOS E
  - Minimize the footprint and maximize thru lanes with triple left turn lanes (LOS D)
  - Minimize overall roadway footprint, add a single additional thru lane on westbound Burleigh, and limit left turn bays to two by lengthening storage bays (LOS E). Both require real estate acquisition with one requiring many complete acquisitions. Both avoid very costly construction and real estate acquisition costs associated with grade-separated intersections.

The R09 Workshop focused on a single project interchange and, specifically, a project performance comparison of LOS D and LOS E. At the time of peer exchange, the final report for this demonstration workshop had not been completed (draft report comments were being addressed).

The current schedule for the availability of construction funding and completion of the procurement and construction project phases are in mid to late 2020s, so the recognized

benefits of the R09 predicted project performance will not be available for quite some time. **Figure 7** shows an illustration of the area of the STH-100 project in Wisconsin.



**Figure 7. Illustration of the STH-100 Project in Wisconsin.**

Wisconsin DOT highlighted the following obstacles and lessons learned from their overall and R09 risk management experience to date:

### **Risk Management Obstacles**

- Lack of commitment by organization – Starting with the top of the organization, it is understood that everyone needs to implement this methodology and be accountable for its maintenance.
- Lack of knowledge of what risk is and is not – Need top management and financial/planning staff to buy in and to participate to understand risk analysis information and the effects of the ranges of cost and schedule impacts.
- Lack of consistent project management technique – Need project managers to understand how to use risk analysis information and successfully hand off to next functional group in life cycle.
- Institutionalize process – Need enterprise strategy how to use risk analysis information.
- Asked for cheapest vs. quality estimate – Convince WisDOT administration that including identified risks to cost and schedule will be mitigated and managed throughout the process from planning through construction and that it provides good stewardship of public money.

## **Risk Management Lessons learned**

- Collect and develop mitigation strategies that will be supported by the agency.
- Collect and develop common risks to begin risk registers.
- Understand how numbers are being used to calculate cost and schedule impacts and how all can affect the outcome of analysis.
- Find out what reporting requirements are needed on project and program levels.
- Difference in cost performance reporting between Wisconsin DOT (current year amounts), and FHWA (requires year of expenditure amounts).
- Principles and information included in the R09 template are being included in a new system for Wisconsin DOT for integration with other project management processes.
- Considering risk in all stages of the project can help manage costly changes and delays when these need to be solved in a hurry.

## **Q&A Wisconsin DOT's presentation**

### **Q: Do you reimburse utilities as a risk?**

A: Yes, by policy through the Trans 220 rule.

### **Q: Does WisDOT currently have a formal risk management policy?**

A: There is no current written policy or guidance for mega majors and majors (projects). Ms. Bremser indicated she will consider adopting the 11-step process that PennDOT uses and also their level 1, 2, and 3 risk analysis applications. With all the new leadership changes at Wisconsin DOT this may be an opportunity.

## **ALABAMA DOT R09 IMPLEMENTATION**

Mr. Edwin Perry and Mr. Andrew Wood presented Alabama's experience with the R09 risk management tool as it was applied to the approximately \$1.5B I-10 Mobile River Bridge and Bayway project. The R09 Demonstration Workshop for this project was conducted in December 2016, and the final report was being developed at the time of the peer exchange.

The project is in the very early stage of preliminary design and has many challenging issues. The primary objective of the R09 workshop was to provide the project team the opportunity to identify the most significant threats and opportunities which might be acted upon early on during project development and use the workshop results to demonstrate value added to upper management as well as internal and external stakeholders.

Currently, the Alabama DOT does not have a formal published risk management procedure. However, risks (threats and opportunities) are routinely considered based on engineering judgment, historical data, and project cost.

The R09 Demonstration Workshop resulted in better understanding and defining the following significant project risks :

- Funding availability

- Accurate cost estimates
- Right-of-way clearance and cost
- Railroad coordination and approvals
- Utility agreements, cost, and relocation
- Toll collecting and traffic
- NEPA mitigation
- Unanticipated archaeological findings
- Design changes
- Bicycle and pedestrian improvements

The risk severity and mitigation information assembled during the R09 Workshop will be used and updated as needed by the project team (in-house staff and consultants) to mitigate potential threats and optimize the identified opportunities. The R09 tool as originally developed was envisioned to be appropriate for projects up to approximately \$100M. However, Alabama has learned that the R09 tool may also be valuable for larger projects as a preliminary risk management assessment for further more complex studies where more robust fully quantitative methods (probabilistic methods) are applied.

Obstacles and lessons learned from Alabama’s R09 experience were summarized during the presentation as follows.

### **Risk Management Obstacles**

- Staff’s perception of “that’s not how we’ve done it before.”
- Disagreement in what the risks are, severity, mitigation approaches, etc.
- Difficulty in accurately defining the base cost with no contingencies.
- Need to limit the number of workshop participants.

### **Risk Management Lessons learned**

- Gathering people from different fields (construction, geotechnical, utilities, etc.) helps to highlight future considerations and risks.
- In future, may consider meeting in smaller groups instead of large one.
- Make sure everybody understands parameters (type or risks, severity levels, etc.)
- Set up risk factors (cost and time) comparable to the project size.

### **Recommendations to Advance Risk Management in Alabama**

Finally the presenters offered the following suggestions to advance risk management within the Alabama DOT:

- Identify a designated project risk manager.
- Continue to use and refine the process on this project to show benefits of risk assessment and how it can be applied to future projects.
- Adapt the R09 tool to fit Alabama’s projects and needs.

## PEER EXCHANGE SUMMARY AND NEXT STEPS

Mr. Chesnik and Mr. DiMaggio thanked the participants for attending the peer exchange and for sharing their risk management knowledge and experiences. They noted that there was a great deal of time spent during the presentations on the project description, organizational explanations, and current and future status of risk management in the respective organizations. Collectively, this portion of the program was a big part of the value provided by the peer exchange, as it illustrated the broad and diverse range, level, and approach of risk management used by the participating DOTs.

As intended and expected, it was clearly demonstrated that the R09 tool is one of many tools that can be used to complete the risk management process on a project and program. It is not a “silver bullet.”

Mr. Figueroa discussed the next steps of the R09 implementation, which include the completion of a peer exchange summary report (this report) and a case study. The implementation also includes remaining technical assistance such as several demonstration workshops, training sessions, and other technical assistance to complete the integration and adoption of R09 into the State DOTs’ risk management processes and procedures. Finally, Mr. Figueroa spoke about continuing to develop a R09 community of practice to promote resource sharing and assistance within the DOTs participating in the R09 implementation. He presented several ideas to contribute to the community of practice, by reaching out to peers, sharing best practices, resources, accessing and using the R09 resources in the [FHWA Go SHRP2 website](#), hosting training sessions, and participating in conferences and panels.

## APPENDIX A—LIST OF PARTICIPANTS

State/Organization	Title/Position	DOT or FHWA	Email
<b>Florida</b>			
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## APPENDIX B—PEER EXCHANGE AGENDA

**January 31-February 1, 2017**

**Hyatt Place Hotel**

**5435 Forbes Place**

**Orlando, FL 32812**

<b>DAY 1</b>	
7:30 AM	Registration
8:00 AM	<b>FHWA, AASHTO, and Florida DOT Welcome:                      Agenda overview, Table Introductions &amp; Logistics</b> By: Carlos F. Figueroa, FHWA R09 Program Manager, Keith Platte, AASHTO SHRP2 Program Manager, and Brian Blanchard, Florida DOT Assistant Secretary of Engineering & Operations Henry Pinzon, Florida Turnpike Environmental Management
8:30 AM	<b>Summary of R09 Risk Management Deployment to date</b> By: Jerry DiMaggio, ARA and Kevin Chesnik, ARA
<b>9:45 AM</b>	<b>BREAK</b>
10:00 AM	<b>Florida DOT R09 Implementation</b> By Greg Davis, Florida DOT
10:45 AM	Question & Answer Session
11:00 AM	<b>Oregon DOT R09 Implementation</b> By: Lea Ann Hart-Chambers, Oregon DOT
11:45 AM	Question & Answer Session
<b>12:00 PM</b>	<b>LUNCH</b>
1:00 PM	<b>Moderator Welcome Back</b> By: Kevin Chesnik, ARA
1:05 PM	<b>Pennsylvania DOT R09 Implementation</b> By Brian Shunk, PennDOT
1:50 PM	Question & Answer Session
2:05 PM	<b>Minnesota DOT R09 Implementation,</b> By Jennifer Read, MnDOT
2:50 PM	Question & Answer Session
<b>3:00 PM</b>	<b>BREAK</b>
3:15 PM	<b>Moderator Welcome Back</b> By: Jerry DiMaggio, ARA R09 Project Manager
3:20 PM	<b>Update on R09 Template, User's Manual, and Equation's Sheet and Facilitator                      Training</b> By Jerry DiMaggio and Kevin Chesnik, ARA
4:10 PM	Question & Answer Session
4:25 PM	<b>Day 1 Closing Remarks and Instructions for Day 2</b> By: Jerry DiMaggio, ARA R09 Project Manager
4:30 PM	Day 1 Adjourn

<b>DAY 2</b>	
7:45 AM	Sign-in
8:00 AM	<b>Moderator Welcome Back and Recap of Day 1</b> By: Kevin Chesnik, ARA
8:15 AM	<b>Arizona DOT R09 Implementation</b> By Madhu Reddy, Arizona DOT
9:00 AM	Question & Answer Session
9:15 AM	<b>Puerto Rico R09 Implementation</b> By Migdalia Carrion-Alers, Puerto Rico Highway and Transportation Authority
10:00 AM	Question and Answer Session
<b>10:15 AM</b>	<b>BREAK</b>
10:30 AM	<b>Moderator Welcome Back</b> By: Jerry DiMaggio, ARA R09 Project Manager
10:35 AM	<b>FHWA Federal Lands Highway Division R09 Implementation</b> By: James Herlyck and Doug Smith, FHWA FLH
11:20 AM	Question & Answer Session
<b>11:35 AM</b>	<b>LUNCH</b>
12:45 PM	<b>Moderator Welcome Back</b> By: Kevin Chesnik, ARA
1:00 PM	<b>Wisconsin DOT R09 Implementation</b> By: Sharon Bremser and Frank Pritzlaff, Wisconsin DOT
1:45 PM	Question & Answer Session
2:00 PM	<b>Alabama DOT R09 Implementation</b> By: Edwin Perry III
2:45 PM	Question & Answer Session
<b>3:00 PM</b>	<b>BREAK</b>
3:15 PM	<b>Moderator Welcome Back</b> By: Jerry DiMaggio, ARA R09 Project Manager
3:20 PM	<b>Peer Exchange Summary</b> By: Jerry DiMaggio, ARA and Kevin Chesnik, ARA
3:35 PM	Additional Question & Answer Session
3:45 PM	<b>Next Steps and Closing Remarks</b> By Carlos F. Figueroa, FHWA R09 Program Manager
4:00 PM	Peer Exchange Adjourn

## APPENDIX C—RISK MANAGEMENT SURVEY

*Question 1:* Does your Leadership support development of Risk Management Policies in your agency? What type of questions and information is your Leadership asking about the risk management program?

*Question 2:* Is your Leadership asking to measure effectiveness and Return on Investment (ROI) of your risk management program? What metrics are you using or looking to use to measure these?

*Question 3:* Have you exposed other staff to the train the facilitator materials in your agency?

*Question 4:* Please list any additional Demonstration projects that your state has completed in addition to the FHWA-led R09 Risk Management Demonstration projects covered in any workshops to date? Have you updated any of the Demonstration Workshop Risk Management reports?

*Question 5:* Please list any current or anticipated obstacles to further implementing Risk Management and specifically the R09 tools that your state is experiencing.

*Question 6:* Please provide examples or list the successes your state has had in further developing Risk Management and specifically the R09 risk management tools.

*Question 7:* Please list any issues using the R09 Risk Management excel spreadsheet tool for state project and program analysis of risks and the overall risk management process.

*Question 8:* Please provide any policy and procedural changes or ideas your state has to incorporate R09 Risk Management Tools and further develop Risk Management into your existing risk management, project management and program delivery procedures, policies and practices.

*Question 9:* What else would you like assistance with to have a successful Risk Management Program in your agency?

*Additional Comments:*