The Collaborative Benefits of Using FHWA's INVEST – Arizona Department of Transportation Sustainability Implementation Final Report
Infrastructure Voluntary Evaluation Sustainability Tool

The Collaborative Benefits of Using FHWA’s INVEST – Arizona Department of Transportation Sustainability Implementation
Final Report

Arizona Department of Transportation
April 2015

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<th>Description</th>
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<tbody>
<tr>
<td>AID</td>
<td>Accelerated Innovation Deployment</td>
</tr>
<tr>
<td>ADOT</td>
<td>Arizona Department of Transportation</td>
</tr>
<tr>
<td>ARS</td>
<td>Arizona Revised Statutes</td>
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<tr>
<td>ASU</td>
<td>Arizona State University</td>
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<tr>
<td>bqAZ</td>
<td>Building a Quality Arizona</td>
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<tr>
<td>COG</td>
<td>Council of Governments</td>
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<tr>
<td>CSS</td>
<td>Context Sensitive Solutions</td>
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<tr>
<td>EDC</td>
<td>Every Day Counts</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Study</td>
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<td>FHWA</td>
<td>Federal Highway Administration</td>
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<tr>
<td>GI</td>
<td>Green infrastructure</td>
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<tr>
<td>GRS-IBS</td>
<td>Geosynthetic Reinforced Soil–Integrated Bridge System</td>
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<tr>
<td>INVEST</td>
<td>Infrastructure Voluntary Evaluation Sustainability Tool</td>
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<tr>
<td>LED</td>
<td>Light-emitting diode</td>
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<tr>
<td>LCA</td>
<td>Life-cycle assessment</td>
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<tr>
<td>MAP</td>
<td>Moving Ahead for Progress</td>
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<tr>
<td>MPD</td>
<td>Multimodal Planning Division</td>
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<tr>
<td>MPO</td>
<td>Metropolitan Planning Organization</td>
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<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<td>NSBP</td>
<td>National Scenic Byways Program</td>
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<tr>
<td>OM</td>
<td>Operations and Maintenance</td>
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<tr>
<td>PD</td>
<td>Project Development</td>
</tr>
<tr>
<td>PMT</td>
<td>Project Management Team</td>
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<tr>
<td>SP</td>
<td>System Planning</td>
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<tr>
<td>SPR</td>
<td>State Planning and Research</td>
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<tr>
<td>S&amp;T</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>TBL</td>
<td>Triple bottom line</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
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Sustainable Transportation
Planning, Developing and Maintaining for the Public Good

Arizona’s transportation infrastructure is spread over 114,000 square miles, operates from sea level to 6,000 feet and withstands temperatures that range from below 0°F to over 120°F. Maintaining optimum health and performance of this infrastructure is critical to Arizona’s economic vitality, quality of life, and natural and built environments. The Arizona Department of Transportation (ADOT) recognizes the critical need to plan and prioritize resources more efficiently in order to maintain and operate a robust, economically beneficial transportation network. Through continuous improvement practices, ADOT strives to strategically invest resources to achieve the highest possible return. ADOT also recognizes, in relation to investment and return dynamics, the importance of delivering transportation solutions in a more sustainable manner to achieve economic, social and environmental goals. ADOT is in the early stages of implementing sustainable strategies into core planning, design, construction, operations and maintenance activities.

The Federal Highway Administration (FHWA) Sustainable Highways Program and the Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) Implementation Program have been and continue to be a valuable opportunity for ADOT to acquaint itself with an accessible and comprehensive platform for assessing programs and practices using a holistic sustainability lens. INVEST has already helped ADOT’s INVEST Working Group to validate strategic directions, increase knowledge across core functions and advance a decision-making framework around sustainability best practices. In 2011 ADOT was a key participant in the INVEST Version 1.0 beta-test program and was highly motivated to participate in the 2013 INVEST implementation opportunity focusing on the Project Development module.

Though many states and local public agencies are encouraging and implementing sustainability plans or efforts, integration inside a state department of transportation can be a particularly complex, yet welcomed challenge. Traditional design and construction dynamics, where a given discipline is focused only on their respective area of expertise, is not always conducive to adopting a collaborative sustainably process. ADOT has been changing how it approaches sustainability and INVEST is one of the tools that has assisted in that change. The tool has the capacity to ensure those involved in a project have a format to assess and consider a host of cross cutting sustainability concepts outside their immediate discipline. This, in itself, promotes an internal thought process which otherwise goes unexploited. Through the use of the tool, ADOT has made inroads into better understanding the sustainability playing field as it encompasses transportation systems.
ADOT realized a series of sustainable implementation milestones in 2014. ADOT’s Multimodal Planning Division issued an updated Metropolitan Planning Organization/Council of Governments Manual further clarifying where our stakeholders may engage ADOT on this topic. ADOT increased partnership activities with both the Arizona State University/Julie Ann Wrigley Global Institute of Sustainability and transportation sustainability training with our Local Public Agency partners. Accelerated Innovation Deployment (AID) Demonstration funding was received and will be used to replace an antiquated lighting system with new light-emitting diode (LED) technology in the historic US 60 Queen Creek Tunnel. In addition, ADOT developed an Excellence in Advancing Sustainable Project Development Award Program. The Agency is looking at 2015 as a prime opportunity to drive a host of sustainable transportation directives, to further contribute to national conversation, and to enhance its standing as a state DOT leader in sustainability implementation.

Sincerely,

Dallas Hammit

Deputy Director for Transportation and State Engineer

Sincerely,

Steve Boschen

Transportation Division - Director
ADOT & INVEST Summary

FHWA INVEST Tool
INVEST includes a collection of sustainability best practices, called criteria, intended to help transportation practitioners evaluate programs and projects in the area of sustainability. The goals of INVEST include identifying these criteria, assisting agencies in researching and applying the criteria, and establishing an evaluation method to measure the progress toward more sustainable highway projects.

The INVEST web-based tool allows users to self-evaluate programs or projects using these criteria to obtain a snapshot of the sustainability of the program or project in time. The tool also allows the user to include notes on scoring and implementation actions that can assist the user in integrating criteria and making progress over time. Although many agency efforts could already be considered sustainable, INVEST is focused on "above and beyond" efforts; efforts that are typically required are not included within the INVEST criteria.¹

INVEST System Planning
System Planning (SP) is the first step in the lifecycle of a transportation project. This is where an agency's system-wide network is analyzed and assessed to identify projects that will improve the safety, capacity, access, operations or other key features of the system. This module focuses on performing system-level analyses in a manner that contributes to the overall sustainability of the network and the individual projects programmed in this phase of the lifecycle. The SP module contains 17 criteria combined into a single scorecard to provide agencies the rationale and guidance for incorporating sustainability characteristics into their transportation planning and programming processes. You will see a discussion of linking the INVEST SP module to the National Environmental Policy Act (NEPA) through the use of innovative scope of work inputs to improve project acceptance.²

INVEST Project Development
Project Development (PD) is the second step in the lifecycle of a transportation project. This is where specific projects conceptualized and programmed in the System Planning processes are planned, designed and constructed. The Project Development module includes criteria that span the entire project development process from early planning, alternatives analysis, environmental documentation, preliminary and final design, and construction. Although the criteria span all phases of project development, including construction activities, the criteria are written such that the lead scorer has control over the decisions and actions necessary to meet all of the criteria. For the construction phase, this can typically be done by incorporating elements in the project plans and specifications. The PD module contains 29 criteria and constitutes the bulk of ADOT's 2014 sustainability efforts.³
INVEST Operations & Maintenance
Operations and Maintenance (OM) is the third step in the lifecycle of a transportation project. This is where infrastructure planned, designed and constructed in prior steps is operated and maintained, resulting in needs for data collection and new project identification. This information is then passed back to the SP step, to complete the lifecycle of projects. This module focuses on performing system-level operations and maintenance activities in a manner that contributes to the overall sustainability of the highway network. The OM criteria are primarily written for the scoring of an agency’s internal, system operations as well as, asset management and maintenance activities performed on the network infrastructure. The OM module contains 14 criteria and will constitute the bulk of ADOT’s 2015 sustainability efforts.
2014 INVEST Outcomes & Key Recommendations

Outcomes – FHWA / Agency / Programmatic

- Integration of sustainability tools into ADOT decision making
- Identification of functional gaps, and investigate the boundaries of inherently non-quantifiable problems – i.e. sustainability boundaries
- Understand that sustainability triple bottom line (TBL) is measured over years / decades
- Began the process of integrating ADOT’s stakeholders and partners into the transportation sustainability conversation
- Contribute to the national conversation

Outcomes – ADOT Intermodal Transportation Division Development / Construction

- ADOT developed an Excellence in Advancing Sustainable Project Development Award Program
- 18% of the projects rated silver and 40% of the projects rated bronze
- Framework approach established for sustainable earthwork design and implementation (INVEST PD-21)
- Framework established for upgraded approach to recycled materials (INVEST PD-20)
- Plans to improve management of waste streams from pavement preservation projects
- Use of INVEST to maximize sustainability design of roundabouts
- Use of INVEST to evaluate projects ranging from pavement preservation, to bridge deck rehabilitation, to new lane miles
- Accelerated Innovation Deployment (AID) Demonstration funding for new light-emitting diode (LED) technology - historic US 60 Queen Creek Tunnel

Key Recommendations to FHWA (also highlighted in red in Appendix A-1)

- Develop PD criteria for contributions from the Native American Tribal Agencies that streamline project delivery, contribute to sustainability and “first recognize the great diversities of culture, history, geography, language, government, religion/belief systems, economy, infrastructure, and worldview prior to choosing the right practices to use.”
- Develop PD criteria if the project team even conducted a basic inventory of sustainable practices implemented on a given project
- Separate PD criteria for Construction Materials – there are a myriad of materials (standard and non-standard) that can be used to greatly enhance sustainability credit beyond earthwork and pavement
- Separate SP, PD, and OM Criteria for Extreme Weather and Resilience Planning and actual Implementation
- INVEST has a disadvantage related to Federal Lands and Tribal Lands in that credit is not available for Western States that have incredible amounts of social, environmental, economic project development consideration related to Federal and Tribal Lands
- See Appendix A-1, ADOT 2014 comments to FHWA on INVEST for added observations
2015 Action Plan

The 2015 INVEST Implementation will center on an extensive assessment of ADOT operation and maintenance practices using the INVEST OM module. The ADOT project management team (Steven Olmsted and Emily Lester) will lead the tasks listed in Table 1. The project will have a senior advisor and reviewer (Jean Nehme – Director of Performance Management and Research). The ADOT project management team will operate as a liaison with the ADOT groups, FHWA and project stakeholders to coordinate movement through the scheduled tasks, workshops and problem solving. The project management team will prepare the study reports. Please find some additional steps identified for the work plan below.

Work Steps to Achieve Action Plan:

- Discuss deliverables with FHWA.
- Establish INVEST O&M participation groups.
- Identify ADOT’s policies, procedures and practices that might align with INVEST O&M.
- Identify ADOT’s Engineering policies, procedures and practices that align with INVEST O&M.
- Review the INVEST criteria and gather information.
- Identify criterion; title, goal, point ranges, sustainability linkages to the triple bottom line (TBL) principles (social, economic, environmental), participant descriptions, scoring requirements, and scoring sources for the INVEST practice exercises.
- Conduct INVEST workshop(s).
- Develop three (3) case studies
- Identify INVEST tool best practices, issues encountered, improvements, future actions to contribute to the overall final report.

Deliverables (See Table 1 next page)
<table>
<thead>
<tr>
<th>Task</th>
<th>2014</th>
<th>2015</th>
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<tbody>
<tr>
<td>Phone call with FHWA staff</td>
<td>Nov</td>
<td>Dec</td>
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<tr>
<td>Consultant RFP</td>
<td></td>
<td></td>
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<tr>
<td>Retain Consultant/Organize participation group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Compile inventory, policies, procedures, practices</td>
<td>Mar</td>
<td>Apr</td>
</tr>
<tr>
<td>2. Define Focus Group agenda and Q&amp;A</td>
<td>Jan</td>
<td></td>
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<tr>
<td>Project Summary circulated for comments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Conduct INVEST PD &amp; OM workshops</td>
<td>Feb</td>
<td>Mar</td>
</tr>
<tr>
<td>4. Participants use tool</td>
<td>Apr</td>
<td></td>
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<tr>
<td>5. Compile results from workshops and usage</td>
<td>May</td>
<td>Jun</td>
</tr>
<tr>
<td>Project Summary II circulated for comments</td>
<td></td>
<td></td>
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<tr>
<td>6. Produce best practices, issues encountered, INVEST improvements, future actions summaries</td>
<td></td>
<td></td>
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<tr>
<td>7. Issue Case Studies on specific INVEST criteria of interest.</td>
<td></td>
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<tr>
<td>Final Report</td>
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Notes:  
= Deliverable  
= Work Occurring
Abstract

The Federal Highways Administration (FHWA) has developed an online mechanism to aid in the development of innovative sustainable practices within a department of transportation. The Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) may be utilized both on a state and local government level to document current best management practices and further analyze potential sustainable designs focused on achieving the Triple Bottom Line goals of meeting economic, environmental and social needs. The tool’s optimal performance is achieved when a collaborative effort is employed within any particular department of transportation. Through discussion of multiple disciplines, INVEST has the potential to transform an agency which may promote higher thinking and efficient use of funding while reaching or exceeding transportation needs.
Chapter 1: Introduction

The three primary principles of sustainability revolve around achieving an efficient, well-balanced use of social, environmental and economic resources commonly known as the triple bottom line. In theory, this will allow for proper use of funding while attaining all potential project needs. A sustainable highway, for example, will not only incorporate the need for mobility and transportation alternatives but also consider safety, accessibility, livability, asset management and environmental protection (1). As seen in Figure 1 to the right, achieving sustainable development may become a challenge, especially on a daily basis. The window of opportunity to fulfill all that is needed requires extensive coordination not only within a core group of individuals delivering the project, but should also include those who are consider stakeholders within the community. Considering all the multiple driving forces of any transportation project, economic responsibility centered on ensuring all potential aspects within the context of the project are addressed is by far the desired outcome. As stated in the Guidebook for Sustainability Performance Measurement for Transportation Agencies,

Often, a goal will support more than one principle. Yet no one goal in itself is sufficient to achieve sustainability- it takes multiple goals, pursued in concert, to promote sustainability. When a final set of goals is defined, it’s important to crosscheck the package of goals to ensure that all of the principles are well addressed. In doing so, take care not to force-fit the goals to make them map to the principles. A balanced goal set, however, achieves comprehensive coverage of the basic principles of sustainability... (2)

The most effective use of resources in this day and age is one in which multiple objectives are achieved and the methods which lead to those outcomes are documentable and repeatable. FHWA has recognized this ambition and has launched the prototype Infrastructure Voluntary Evaluation Sustainability Tool (INVEST). The primary goals of the tool are to aid in further development of best management practices, establishment of standardized sustainability measures for repeatability in every DOT project and facilitation of a collaborative effort when dictating project planning, development, and operations and maintenance activities within a transportation setting.
INVEST is broken down into three modules which represent the basic transitions of a project’s life cycle within the transportation realm, as seen below in Figure 2: System Planning, Project Development, and Operations and Maintenance. “While many transportation agencies recognize the importance of sustainability, they often struggle to apply the concepts of sustainability in their core activities. Resources [are] needed to establish and use sustainability performance measures and to gauge the effectiveness of strategies to address sustainability” (2). INVEST provides a list of measures known as ‘criteria’ for each life cycle stage. This essentially allows the practitioner to grade/score areas of interest which will reflect what is being considered at a national level.

![FIGURE 2 INVEST modules (3).](image)

For example, the Project Development module initially prompts the practitioner to establish the type of project in question: urban extended, urban basic, rural extended, rural basic, paving or custom. This break down may be seen in figure 3 below.

![FIGURE 3 Type of project options within the Project Development Module (4).](image)
Once a type of project is chosen, specific criteria applicable to the project depth will be presented through a series of questions which may be considered on any given transportation project. These questions will range from energy efficiency, public involvement, material usage or earthwork balance, life cycle cost analysis, safety, wildlife connectivity, fiber optic cable installation, etc. Depending on how the criteria questions are answered, a score will be tabulated to generate a sustainability rating of bronze, silver, gold or platinum coinciding with a numerical value. This flexibility among criteria will aid in allowing the tool to more accurately depict several types of day to day projects ranging from culvert extension or pavement preservation to dividing a rural highway or constructing of a new urban traffic interchange.

Overall, INVEST is a tool to utilize when attempting to capture current best management practices and document new sustainable objectives. It will provide a platform for multiple levels of government to initially assess their sustainability efforts as dictated on a national scale. Realizing the potential for implementing the tool into routine practice, ADOT seized the opportunity to coordinate with FHWA in further analyzing INVEST 1.0. The tool was evaluated in terms of both how the criteria would apply to a variety of development projects, specifically the installation of new roundabouts, as well as, where the tool would be best housed within a department of transportation at the state and/or local government level. Through the use of several in-house and on location training sessions, ADOT was able to establish the full extent of the Project Development module.

Background

Arizona’s transportation infrastructure is spread over 114,000 square miles, operates from sea level to 6,000 feet, and withstands temperatures that range from below 0°F to over 120°F (see figure 4 below for details). Maintaining optimum health and performance of this infrastructure is critical to Arizona’s economic vitality, quality of life, and natural and built environments. ADOT recognizes the critical need to plan and prioritize resources more efficiently in order to maintain and operate a robust, economically beneficial transportation network.
Through continuous improvement practices, ADOT strives to strategically invest resources to achieve the most efficient possible outcomes. In relation to investment and return dynamics, the importance of delivering transportation solutions in a more sustainable manner to achieve economic, social and environmental goals is essential in guaranteeing ADOT is pursuing noteworthy objectives. However, like many transportation agencies around the country, ADOT is in the early stages of injecting sustainable strategies into core planning, operating, design, construction and maintenance activities.

The FHWA INVEST implementation program has been and continues to be a valuable opportunity for ADOT to acquaint itself with an accessible and comprehensive platform for assessing programs and practices using a holistic sustainability lens. INVEST has already helped ADOT’s INVEST working group to validate strategic directions, increase knowledge across core functions, and advance a decision-making framework around sustainable best management practices.

**ADOT identified three (3) separate INVEST implementation goals:**

- Score projects in ADOT’s 5-year construction program utilizing the Project Development (PD) Module – with a specific focus on statewide roundabout projects.
- Develop an internal ADOT INVEST and ADOT / local government INVEST training framework in order to develop new and novel sustainability operational and partnering opportunities.
- Score multiple projects in the PD Module with an eye on how green infrastructure, low-impact development, multimodal mobility, freight and Context Sensitive Solutions (CSS) can be measured and defined, especially as they affect ADOT’s high-level, data-driven policy evaluation models.
ADOT INVEST Final Report

ADOT’s - Statewide Roundabout INVEST Assessment - Goal 1

Roundabouts are becoming a cornerstone of traffic safety and congestion management, thus it is critical to have a thorough understanding of how future implementation and development directly impact communities’ social, environmental and economic systems. In Arizona, at both the state and municipal level, roundabouts have become a popular option in traffic intersection design/development/safety. Since INVEST looks to “promote cost savings and benefits to social, environmental and economic systems”, roundabout projects were identified as an area warranting further exploration and examination utilizing the scoring criteria. At the project development (PD) level, roundabout planning, design, and construction share multiple INVEST elements such as quality construction, designing pavement for longevity, life cycle concepts, recycled materials, stormwater design, air quality mitigation benefits, local community enhancement, and improved safety. Roundabouts are unique projects in which impacts, on the aforementioned cost savings and benefits, are quantifiable and would be excellent entry points in evaluating the tool. In addition, roundabouts fall within the basic and extended project types and exist in both urban and rural locations which easily align with the INVEST project development module. ADOT examined twenty-five (25) existing, currently designed or under construction roundabouts. The scoring breakdown by PD criteria can be found in Appendix B-1.

The intersection of State Route (SR) 89 and Perkinsville Road, located in Chino Valley, Yavapai County, Arizona, was one of the first ADOT projects to be evaluated using the INVEST project development module. SR 89 is the only state highway connecting Prescott, Prescott Valley and Chino Valley and serves as a key alternative route to Interstate 17 (I-17) and ultimately Interstate 40 (I-40). ADOT proposed improvements to this intersection would include the introduction of a roundabout (see Figure 5 below). According to the final project assessment, the goal of this project is to enhance the overall safety of the existing signalized intersection with a solution that best fits the location based on the existing and future geometric, environmental, traffic, drainage and local stakeholder design considerations. Agency cooperation included FHWA, ADOT, Central Yavapai Metropolitan Planning Organization (CYMPO) and the Town of Chino Valley. The characteristics of this $3 million project were well suited for being scored through INVEST. Additionally, it presented a great opportunity to build a preliminary network of partners interested in conducting a sustainability assessment of ADOT’s roundabout program.

To appropriately blend ADOT’s roundabout design criteria and the parameters set forth inside the INVEST tool, the project team started with these nine (9) objectives:

- Apply the project goals the Town, the public, the regional planning organization, and the assigned ADOT district developed in connection with this project

- Identify how the roundabout would promote and enhance growth given the traffic needs of an economically developing area.

- Design the basic dimensions of the roundabout while fitting within the available right-of-way
- Recognize the variables involved in construction of the roundabout, and then identify the related sustainability criteria

- Consider the impacts to commercial truck traffic, local commercial truck traffic and commercial business at the intersection that utilized trucks in their operations

- Integrate the overall FHWA sustainable highway’s goals and ADOT’s INVEST project

- Stress implementation of sustainable practices and gain project champion’s consensus

- Make wise investment decisions with limited resources

- Encourage changes in professional practice and go beyond compliance

**FIGURE 5 State Route 89 and Perkinsville Road Chino Valley, Arizona (7).**
Roundabout Sustainability Linkage

One of the more engaging conversations that arose out of the SR 89 Perkinsville Road INVEST scoring effort surrounded freight mobility, sustainability linkages and the INVEST PD-13: Freight Mobility criteria. ADOT is well aware, especially in light of the Move Ahead for Progress (MAP-21) freight planning requirements, that enhancing freight mobility supports environmental and economic sustainability principles. ADOT’s project goals aligned nicely with the INVEST PD-13 scoring goals by providing features that make freight transportation more efficient, thereby reducing fuel consumption, decreasing emissions and reducing noise pollution. According to FHWA’s, Advancing a Sustainable Highway System: Highlights of FHWA Sustainability Activities, issued in June of 2014 and prepared by the Center for Transportation Policy and Planning (Volpe);

MAP-21 requires reporting on performance metrics and includes freight-specific performance measures. Performance measures help identify and measure the effectiveness of needed transportation improvements. They also serve as indicators of economic health and traffic congestion. The Office of Freight Management and Operations has completed various performance measurement-related initiatives. Many of these efforts have focused on travel times in key truck corridors and cross-border travel times. (8)

Specific to the SR 89 Perkinsville roundabout project, one objective looked to assist with rush hour traffic queuing, especially as it relates to commercial truck traffic, which may be utilizing SR 89 as an I-17 alternate. In addition, localized agricultural commercial truck traffic was a major consideration as there was such an operation at the southeast corner of the roundabout. The identified route of traffic and enhancements may be seen below in Figure 6. Unique project design considerations included commercial truck traffic context sensitive solutions: commercial truck ingress and egress locations, truck apron width and commercial truck traffic continuous flow considerations. The INVEST scoring exercise was an additional platform in which all these issues could be scored, reviewed and assessed. Ultimately, the project received a Silver rating with a total score of 41 points. ADOT clearly benefited from using INVEST as a simple and easy format to determine sustainable linkages and introduce the sustainability return on investment. Without the tools platform, these design alternatives were not likely to be discussed in extensive detail to allow for the overarching and all-encompassing solution.

The individual FHWA Sustainable Highways State Route (SR) 89 and Perkinsville Road case study can be found in Appendix A-4.
ADOT's Five (5) Year Construction Program vii

ADOT understands that transportation touches everyone’s lives in a very personal way on a daily basis. Transportation is critical to our state’s economic vitality and our quality of life, which is why ADOT engages in a forward-thinking planning process that encourages community and stakeholder participation in transportation investment decisions.

In Phase One of ADOT’s planning process — the transportation vision — the sky is the limit approach is taken. If money was no object, what would Arizona’s transportation future look like? No fiscal restraint means everything is on the table. In 2008 and 2009, ADOT worked with community members and organizations throughout the state to develop the transportation vision by reviewing the needs for the next 40 years. This vision was called the Building a Quality Arizona (bqAZ) Statewide Transportation Planning Framework and was established with no fiscal constraints. The transportation vision for the state sets the comprehensive foundation for other plans that are fiscally constrained.

The Long-Range Transportation Plan — or Phase Two — must take revenues and funding into account. This plan looks 20-25 years into the future and identifies the state’s transportation needs while estimating what resources will be available to meet those needs. This is the plan that sets the overall strategic priorities that guide ADOT’s investments in the future. According to Arizona law, the Long-Range Transportation Plan must be updated every five years. While the
Long-Range Transportation Plan sets priorities, the actual projects are chosen in Phase Three, the Five-Year Transportation Facilities Construction Program. Projects which preserve, modernize and expand Arizona’s highway system have now been formally approved to move forward over the next five years.

State Transportation Board adopts the 2015-2019 Five-Year Transportation Facilities Construction Program. The board’s action determines which projects are now programmed in Greater Arizona while allocating dedicated funding to the preservation of Arizona’s existing highway system over the next five years. In addition, six major projects will move forward in the Pima County region and four major projects will advance in the Maricopa County region using, in part, funding generated by those regions.

Much like the current Five-Year Program, the 2015-2019 Five-Year Program reflects a major focus on preserving the existing state highway system while moving some programmed projects forward. ADOT must prioritize projects due to stagnant revenue from the gas and vehicle license taxes and from decreased federal funding — all of which support the Five-Year Program. The 2015-2019 Five-Year Program includes a three-percent increase in preservation spending over the current program, with a steady increase in preservation funding over the next 10 years.

The Five-Year Program serves as a blueprint for future projects and designates how much local, state and federal funding is allocated for those projects. It is divided into three sections: the Maricopa County region, the Pima County region and the 13 counties that make up Greater Arizona.

The Five-Year Program is updated annually. Each program begins with a long-range visioning process, moves into a more realistic 20-year plan and finally yields each Five-Year Program. The program is developed by working closely with local planning organizations and community leaders to identify ready-to-construct or design projects.

Sustainability linkages and the INVEST tool criteria can be found thematically throughout ADOT’s long term transportation planning efforts. During 2014 ADOT developed the local government sustainability outreach effort (discussed next section) to complement ADOT’s long term planning sustainability goals as they are identified in the ADOT, MPO, and COG Guidelines and Procedures Manual in Chapter 17-11 (see Appendix). ADOT’s Multimodal Planning Division has had in place since 2011 a sustainability program intended to provide ADOT, MPOs, COGs and local agencies a resource to assist with sustainable practice planning and implementation strategies. The ADOT Sustainability Program monitors the industry at local and national levels to bring that knowledge base and experiences to Arizona’s communities.

It is a resource to support the connection between community development and transportation and the contribution to the triple bottom line – economic vitality, community livability, and environmental health. The program provides technical assistance, including how ADOT furthers its partnerships, to support new decision making techniques around sustainable growth and economic development, building healthy communities, climate / extreme weather resiliency and preparedness, green infrastructure and renewable resource opportunities. The program also participated in the INVEST Beta testing. During 2014 the sustainability efforts expanded to the Intermodal Transportation Division (ITD) and involved the INVEST and sustainability activities covered in this report.
ADOT INVEST Final Report

ADOT / Local Government INVEST Training and Scoring - Goal 2
City of Sedona, Arizona

As part of ADOT’s INVEST effort an additional outreach and training element to local governments was incorporated. ADOT identified this local government participation as a great partnering tool, especially for those that had transportation projects administered by ADOT. This training opportunity is significant, since a portion of ADOT’s highway system passes through many of our states local governments functioning as the sole main arterial to many remote towns in the state.

The City of Sedona, Arizona, INVEST training was the first of several outreach and training efforts scheduled by ADOT. The training was an opportunity to develop and refine a local government training framework that would be transferrable to other cities around the state. The City of Sedona was very amenable to using INVEST to examine one of the largest, most extensive projects the two entities had undertaken in recent years – the complete design, development and construction of seven roundabouts while expanding and dividing the mainline roadway redevelopment on State Routes 179 and 89A (four of the roundabouts can be found in Figure 7 to the right).

The training process, subsequent support efforts and the City’s Public Works Department that houses their transportation efforts, found the INVEST experience went extremely well. Seeing the direct alignment with the City’s planning goals, the City of Sedona conducted their own INVEST case study which received an outstanding Platinum rating.
INVEST as a collaboration tool – Goal 2

During the first internal INVEST training, two person teams were assigned to work in tandem. The teams were comprised of one civil engineer from ADOT’s Statewide Project Management team and one environmental planner from ADOT’s Environmental Planning Group. Individuals with a civil engineering, analytical background were coupled with those whom possessed an environmental, rules oriented perspective. It quickly became apparent to the training team a new and novel collaboration process had materialized. This collaboration developed a unique perspective centered on applying the tool to the project development process, while simultaneously benefiting from the extensive real time scorer opinions. It was determined that INVEST could be scaled to play a key role in a more “cradle to grave” scoring process - a collective approach in which the process of scoring a project is handed off between planning, project and maintenance personnel to score (see Figure 8 below). To briefly describe, INVEST’s involvement would begin in the early planning and design phases, seamlessly move into environmental, materials and other technical studies, and conclude after construction and mitigation are complete. With multiple disciplines engaged throughout the INVEST process, this will and should ensure a more comprehensive and efficient use of the tool. A basic diagram (see Figure 9 below) has been provided showing examples of how some of the PD criteria were further categorized for internal ADOT disciplines analysis.

FIGURE 8 Overview of the INVEST modules (System Planning, Project Development, and Operations and Maintenance) and potential discipline responsibilities (Metropolitan Planning Organizations, Statewide Project Management, and Natural Resources Division) (19).
INVEST could not only potentially lead to a more substantial, sustainable design, but also aid in furthering lines of communication among members of ADOT.

Sustainability rating systems have been widely accepted as a way of quantifying how sustainable construction projects are. A method that can be used to improve the consistency is through group decision making. Instead of using a single representative from the DOT, a group of persons who have the authority to make sustainable decisions could participate. (14)

It sparked new natures of discussion which may ultimately lead to all individuals involved learning more about various aspects of the development process. This type of learning opportunity is and will continue to be essential in ensuring project delivery in a consistent and timely manner. Further development of the scoring criteria and how those questions are sequenced in version 1.1 should further ensure the ultimate goal of implementing the program and allow for a more flexible applicability. INVEST was well received during ADOT’s internal INVEST training, as well as, in the on-location training opportunities. Particularly in the Sedona example, the application was able to enumerate current best management practices and existing sustainable behaviors. It provided a discussion based review of multiple layers of disciplines required for the completion of any project. This allowed for the individuals involved to view the breadth and depth of knowledge required by their peers to perform daily tasks. The vital aspect of INVEST was the sparked innovative thought process and challenge of continued improvement which is driven by a collaborative effort. It was irrefutably acknowledged as a
beneficial tool which may continue to broaden lines of discussion, facilitate essential communication and lead to further modernization of design. As seen in Table 1 below, collaboration is a key factor in pursuing innovative design while utilizing and optimizing research. INVEST provides the ability for any level of transportation department to re-evaluate existing procedures and consider otherwise missed opportunities for best management practices or sustainable implementation.

TABLE 1 Mechanism for S&T Awareness and Engagement (15).

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Description</th>
<th>Objective</th>
<th>Measure of Success</th>
<th>Challenges</th>
<th>Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data analytics and Horizon Scanning</td>
<td>Watching the literature, analyzing trends</td>
<td>Generate overview; map the average to recognize the outstanding</td>
<td>New insights generated. Has this information changed what we did in the last year? How and how often?</td>
<td>Open literature lags behind the research process</td>
<td>Unobtrusive; gathers information across a wide range of places</td>
</tr>
<tr>
<td>Reading</td>
<td>Reading the literature</td>
<td>Learn technical content</td>
<td>Are researchers more up-to-date as a result of this activity? (Are researchers citing most recent findings?)</td>
<td>Quantity is often voluminous</td>
<td>Good technical detail available</td>
</tr>
<tr>
<td>Professional meetings</td>
<td>Attending meetings organized by professional societies</td>
<td>Access to the newest results; identify future leaders</td>
<td>Has the information gathered at meetings changed what was done in the last year? How and how often?</td>
<td>Relevant new results are scattered among meetings</td>
<td>Fresh results; informal interaction</td>
</tr>
<tr>
<td>Workshops</td>
<td>Organizing workshops around particular topics of interest</td>
<td>Fresh results in targeted areas</td>
<td>Has the information gathered at workshops changed what was done in the last year? How and how often? Are researchers more up-to-date as a result of this activity?</td>
<td>Funding and logistics; getting the right people there</td>
<td>Concentrated collection of relevant research; much opportunity for informal interaction</td>
</tr>
<tr>
<td>Personal contact</td>
<td>Visiting laboratories or other research sites, exchange of personnel</td>
<td>Access to the newest results</td>
<td>Are researchers more up-to-date as a result of this activity? Are new insights reported? Have the new insights changed what is being done?</td>
<td>Finding the best laboratories to visit</td>
<td>Visual access to research process; can talk to more people about the work</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Designing, carrying out, and analyzing research together</td>
<td>Create new knowledge, combine skills</td>
<td>Were we able to do things we could not have done on our own? Have we opened our window on developments in an important research area?</td>
<td>Hard to keep knowledge private when competition is involved</td>
<td>Deep understanding for both partners; cost efficiency</td>
</tr>
<tr>
<td>Active</td>
<td>Project funding</td>
<td>Develop specific new knowledge</td>
<td>Did the project contribute to a growing research area of interest to the organization? Has there been appropriate follow-up engagement in that area? Did seed grant create relationships that were helpful in engagement in the area?</td>
<td>Technical mastery is hard for program managers to achieve mission when not working in the laboratory</td>
<td>Best people can be chosen; can fill knowledge gaps</td>
</tr>
</tbody>
</table>
Again as seen in Table 1, INVEST resides under the “collaboration” mechanism, designing, carrying out and analyzing research together. This then in turn creates a stepping stone for advancement of any department of transportation to move into “project funding” mechanism, actively collaborating in research projects to develop a new knowledge base. The tool ultimately drives critical discussion, consistency, more sustainable thought and more importantly accountability for not only a well maintained infrastructure, but infrastructure which takes into account economic, environmental and social needs.

**Green Infrastructure/Low Impact Development – Goal 3**

Green infrastructure (GI) and low impact development (LID) are at first glance desirable project development candidates for promoting economic, social and environmental goals. In addition, the obvious context sensitive solutions crossover for transportation projects and life-cycle benefits seems clear. In fact, one of our regional partners, the Pima Association of Governments’ Regional Council (PAG) commended their association’s region for “exceeding GI/LID recommendations put forth in PAG’s 2012 GI/LID Resolution for collaborations, guidance, case studies, incentives, return on investment modeling, policy inventories, and incorporating GI/LID principles into regional planning documents.”

ADOT’s MPO/COG Manual and the current Complete Transportation Guidebook identifies green infrastructure as natural strategies and techniques intended to address urban climate and pollution issues specifically through stormwater management. The INVEST process identified the need to advance the GI/LID conversation and seek ways to engage ADOT divisions and project partnering opportunities. The INVEST process also identified a gap in possible ADOT’s GI/LID adoption. This is the issue of roadside vegetation management and safety clear zone requirements. A first step forward would be identifying local government administered projects...
where ADOT could incorporate GI/LID design, Complete Transportation Guidebook implementation opportunities and local government project goals.

**Context Sensitive Solutions – Goal 3**

A third ADOT goal during the INVEST effort was to review context sensitive solutions (CSS) as it exist inside the agency. ADOT desired to undertake an additional review of this INVEST PD Criteria as so many of our projects affect our stakeholders and the areas that fall under those stakeholders jurisdictions including, but limited to twenty-two (22) recognized tribes, Bureau of Land Management, National Forests, military bases, National Parks, Wildlife Refuges, Local and State Parks and State Trust lands (see Appendix - Land Ownership map).

Extensive CSS is conducted through the project development and environmental processes. Still, ADOT desired to evaluate this component through the sustainability lens. The origins of CSS development in a multi-stakeholder format with an eye toward sustainable design exists within the City of Sedona, Arizona – ADOT administered redevelopment of SR 179.

![Figure 10 Project Development Module Scoring Criteria](image)
ADOT used an innovative approach called a needs-based implementation plan (NBIP) to plan improvements to SR 179. ADOT continuously solicited input from the community through advisory panels, focus groups, workshops, charrettes and other techniques. The NBIP took a CSS approach by balancing safety and mobility with scenic, aesthetic, historic, environmental and other community values. The NBIP was structured around charrettes open to all: first, a planning charrette, in which residents stated their core values and vision for the corridor; second, a gaming workshop giving residents an opportunity to build their role using a tool kit of design elements. At two screening workshops and a third charrette, the community screened twelve planning concepts to produce a single preferred plan for a greatly improved two-lane road designed for maximum context-sensitivity through Sedona, the Village of Oak Creek and the highly sensitive Coconino National Forest.

CSS Qualities: Process

- Early definition by the community (in the first charrette) of its twelve core values, including character, context sensitivity, environmental preservation, multimodality, multiple purposes, roadway footprint, scenic beauty and walkability.
- Use of interdisciplinary teams from the outset of the project, without a dominant role assigned to any one discipline, to encourage a holistic approach.
- Inclusion of local residents on each consultant team.
- Emphasis on SR 179 as a corridor for moving people (e.g., on foot, bicycles or transit vehicles) rather than just vehicles.
- Four expert panels early in the project to educate the public on topics such roadway planning and design principles, multimodal considerations, and CSS.
- Thirty-one community interviews and focus groups at the outset of the project.
- Numerous newsletters, e-newsletters, and speakers' bureau presentations; two postcard surveys.
- Using community values and goals as the foundation for developing planning and engineering concepts.
- Willingness to consider and adopt innovations; e.g., replacement of traffic signals with modern roundabouts.
- Design Advisory Panels from the community assisting with segment concept design, the last phase of the NBIP.
- Use of a single team to plan, design and oversee construction of the project.
- Formulation of detailed improvement concepts by community members at a gaming workshop open to all.
- Multi-tiered screening from more than 80 planning concepts to twelve and eventually one, with the community involved at each step.
- Preparation of a detailed Access Management Plan and a Corridor Management Plan to help preserve the corridor's unique attributes.
- A trade-off analysis of alternative designs for medians, pathways and alignment types (e.g., bifurcated versus two-way roadway).
- Identification of locations for retaining walls, scenic pullouts and transit stops.
- Artists' renderings and simulations to show impacts of alternatives on the local context.
- Illustrative urban design studies at critical locations.
- Use of existing elements where appropriate; e.g., trails in the Coconino National Forest.
- One-on-one meetings with more than 100 property owners.
- Extensive use of maps and aerial photography in community activities.
CSS Qualities: Outcomes

The major benefit was a reconstructed road that is much safer, offers more reliable travel times between I-17 and Sedona, and is less likely to be shut down by crashes and other incidents. It enhances the visual and scenic quality of the driving experience and offers pullouts for scenic viewing. It is now safer and much easier to use for cyclists and pedestrians. The project has brought together agencies and stakeholders who are more likely to collaborate in the future. The All-American Road status that was obtained through this effort enhances the reputation of the community, provides an incentive for preservation, and may bring opportunities for additional federal funding. The new roadway provides safe access for transit users and improved access to nearby trails. It is a tremendous source of pride for the entire community and a boom in tourism, which is the mainstay of the Sedona area’s economy.

CSS and INVEST

With the experience of SR 179 in ADOT’s recent past the CSS sustainability bar has been set quite high. The INVEST CSS Scoring criteria was evaluated on every ADOT INVEST PD scoring project scored. ADOT was pleased to learn that the bar continues to be surpassed with the CSS arena and to look for ways to improve in this area of project development. In fact, the CSS criteria has been incorporated as one of the above and beyond considerations in connection with the Excellence in Advancing Sustainable Project Development Award Program.
Chapter 2: Methodology and Assumptions

How INVEST Works
INVEST provides three scoring modules for transportation professionals to use – system planning, project development, and operations and maintenance. By using the criteria provided in each of these modules, decision makers can evaluate their plans, projects and programs. Scoring enables transportation agencies to gauge their performance in adopting sustainability practices. More importantly, however, INVEST helps agencies identify workable solutions allowing them to further incorporate sustainability into pending planning or project decisions, and to identify potential changes to business processes. In addition, when FHWA received input back from users, it was observed that the collaboration between team members during the evaluation is a highly valuable aspect of the tool.

Each INVEST criterion has a write-up that describes the goal of the criterion, linkage to the sustainability triple bottom line principles, the scoring requirements for receiving points, sources of supporting documentation, and links to resources where users can find additional information about sustainability practices. The web-based format makes it easy for users to score projects by answering scoring questions on the right hand side of the page to determine the score while having access to more detailed information on the left hand side. Space is provided for users to record scoring assumptions and notes, upload supporting documents, and record follow-up actions that would improve the project score.

INVEST Project Development

The Project Development module spans the entire project development process. It includes early project planning, alternatives analysis, environmental documentation, preliminary and final design, and construction. Although the criteria span all phases of project development, including construction activities, the project owner typically has control over the decisions and actions necessary to meet all of the criteria.

Scoring
The Project Development Module of INVEST has 6 project scorecards available for the evaluation of projects. This approach allows for flexibility, since not all of the criteria will apply to every project. Five of the scorecards are based on both the type of project (paving, basic or extended) and the location (rural or urban) and include a defined subset of the 29 total criteria relevant to the type and location of the project. There is also a custom scorecard that includes nineteen core criteria plus user-selected criteria to make a custom self-evaluation for projects that don’t fit well into the five defined scorecards. The ADOT scoring process consisted of both group scoring, one on one scoring and the project management team scoring. In addition, the project management team conducted rescoring on several projects to gain some sense on how a single project outcome might vary by the person scoring.

ADOT Project Development

Building a Freeway: Project Development Process
The project development process starts before construction. The ADOT Project Management Team (PMT) was reviewing the Construction Manual just recently (because, really, who doesn’t
enjoy reading a good manual every now and then?) and came across a passage that terrifically sums up ADOT’s Project Development Process.

The project development process or highway development process (as it is sometimes called) begins with a traffic, safety, or environmental problem that needs to be resolved.

For example, a passing lane may be needed on a rural highway to relieve congestion and reduce crashes. The problem is usually identified locally by ADOT’s Regional Traffic Engineer, a maintenance foreperson, the District Engineer, a city or county Engineer, or an elected official. Some projects are initiated by the Department’s Transportation Planning Division who look at traffic patterns and highway safety on a statewide basis. Most projects are initiated at the district level.

Since there are usually more projects identified than money to build, a process of prioritizing each project, determining its overall scope, and estimating its costs is initiated during the planning phase. During the planning phase, a study is initiated where several engineering alternatives and environmental elements are reviewed in detail and results of the study are often shared at a public hearing. After the public hearing, a design phase and an environmental review process will run concurrently. The project advances through the design, environmental and subsequent pre-construction phases.

But, before a project can move into construction, the project must be included in the Five-Year Highway Construction Program and have funding set aside. The Five-Year Highway Construction Program is reviewed and ultimately approved each year by the State Transportation Board. In addition to approving the Five-Year Highway Construction Program, the State Transportation Board officially awards a contract to the contractor who was successful in the bid process or in some cases is most qualified to complete the project.

The next step is to build the project. The contractor moves on to the project site and an ADOT Construction Field Office oversees the construction work. Their job is to inspect the work, pay the contractor accordingly, and ensure the project serves the public as intended.

The final steps are to open the project to the public and to maintain the project or facility so it performs as needed.

**Range of Projects found at ADOT**

The transportation projects in 2015 that will drive economic development in Arizona and are the key ADOT programmed projects moving forward in Phoenix, Tucson and statewide.

PHOENIX — The new year is shaping up to be a big year for the Arizona Department of Transportation, as the agency will be working on several new and existing projects that will aid economic development and support the efficient movement of goods and services across the state.

All of the projects will be funded with federal and state highway funds, which are collected through gas and vehicle license taxes. In the Phoenix and Tucson metropolitan areas, voters
have approved supplemental tax revenue that enables more transportation projects to move forward in their respective regions.

Phoenix-Area Projects for 2015

Loop 202 South Mountain Freeway
ADOT expects to release the Record of Decision for the long-proposed South Mountain Freeway this spring and work toward selecting a contractor for the proposed $1.9 billion project. The 22-mile-long freeway would run east and west along Pecos Road and then turn north between 55th and 63rd avenues, connecting with I-10 on each end. The South Mountain Freeway is also part of the Regional Transportation Plan funding passed by Maricopa County voters in 2004 through Proposition 400.

Loop 101 and Loop 202 Widening Projects in East Valley
Much of the focus on freeway improvements in the metro Phoenix area will remain on projects that broke ground in 2014 and are due for completion in 2016. The $73 million Loop 101 widening project between Shea Boulevard and Loop 202 (Red Mountain Freeway) in the Scottsdale area is adding an additional lane in each direction along 11 miles of the Pima Freeway, as well as merge lanes between most major interchanges. The $109 million project to widen the Loop 202 Red Mountain Freeway between Loop 101 in Tempe and Broadway Road in east Mesa also will advance, with new general purpose lanes being added between Loop 101 and Gilbert Road, along with HOV lanes between Gilbert Road and Broadway Road.

Interstate 10/Loop 303 Interchange
Among the new freeway projects scheduled to start this year is the “south half” of the Interstate 10/Loop 303 Interchange, which will complete all ramp connections between the two freeways in Goodyear. Work is expected to start this fall. The north half of the interchange opened last August and, combined with a widened Loop 303 north of I-10, has been embraced by West Valley communities as much-needed infrastructure to help drive economic development in the region.

Additional Loop 303 Improvements in Northwest Valley
Farther north along Loop 303, ADOT will launch a project to add an interchange at El Mirage Road by this spring. The new interchange will be built at the same time that crews are improving Loop 303 into a six-lane freeway between Grand Avenue (US 60) and Happy Valley Parkway in Peoria. A third project already underway is creating improved connections at the Loop 303/Grand Avenue interchange. All three projects are scheduled for completion in 2016.

US 60 Improvements in Surprise
Also in Surprise, a project to build a Bell Road bridge over Grand Avenue (US 60) and new ramps connecting the two roadways is scheduled to start late in the year, after a design-build contracting team is selected by ADOT.

Tucson-Area Projects for 2015

Interstate 19 Traffic Interchange Reconstruction (Ajo Way)
In 2015, ADOT will begin work to replace the existing Interstate 19 traffic interchange at State Route 86, also known as Ajo Way, with a single-point urban interchange. The modern
interchange will feature a single set of traffic signals, rather than signals at multiple locations. The $86 million project is expected to improve traffic flow and enhance safety for motorists traveling through Tucson’s southwest side. Construction is expected to continue through 2017 and will also include widening I-19 from Ajo Way to Irvington Road and widening SR 86 to three lanes in each direction between 16th Avenue and Holiday Isle.

State Route 77 Widening (Tangerine Road to Pinal County Line)
After starting work in summer 2014, ADOT will continue efforts to upgrade a six-mile section of SR 77 (Oracle Road) between Tangerine Road and the Pinal county line from two lanes to three lanes in each direction. Along with widening the roadway, planned improvements include raised medians, traffic signal and drainage improvements, wildlife crossings, sound walls and multiuse paths. The $33.9 million project is slated to take two years to complete.

State Route 86 Widening (Valencia to Kinney Roads)
In 2015, ADOT is expected to begin construction on expanding SR 86 (Ajo Highway) in each direction from Valencia to Kinney roads in Pima County, 10 miles west of downtown Tucson. This seven-mile-long, $55 million project in Pima County will enhance safety and improve traffic flow on the highway, which serves as a regional transportation route between Tucson and south-central Arizona. SR 86 provides access to the Tohono O’odham Nation and is widely used to reach the popular tourist destination in Mexico called Puerto Peñasco, also known as Rocky Point.

Statewide Projects for 2015

Northern Arizona

US 93 Widening (State Route 71 to State Route 89 and Antelope Wash sections)
ADOT will continue long-standing efforts to transform the heavily traveled corridor between Phoenix and Las Vegas into a modern four-lane divided highway throughout the entire 200-mile stretch with two US 93 widening projects this year. After beginning last year, ADOT will complete upgrading a three-mile segment of US 93 (Antelope Wash), located approximately 20 miles north of Wikieup (mileposts 101-104) this summer. A second US 93 widening project (State Route 71 to State Route 89), just north of Wickenburg (mileposts 185-190), is expected to break ground this spring.

State Route 89A Spot Widening (Vista Overlook to JW Powell)
This $22.5 million project is slated to improve safety and traffic flow by widening the roadway and constructing passing lanes entering and exiting Oak Creek Canyon through an eight-mile stretch from the popular tourist destination Vista Overlook to the JW Powell interchange, three miles south of Flagstaff. Design of the project is nearly complete and ADOT hopes to start construction this year.

Interstate 40 Pavement Improvements (various projects)
ADOT has several major resurfacing projects in the works along the nearly 360-mile-long I-40, which is one of Arizona’s Key Commerce Corridors, as it stretches from California to the New Mexico state line. Three major pavement preservation projects are set to take place in 2015. This spring will complete final paving on the Rattlesnake Wash to US 93 (mileposts 57-72) section east of Kingman after the project began last summer. Later this year, ADOT will start two
new resurfacing projects east of Flagstaff, including the Navajo county line to Minnetonka (milepost 250-259) and Walnut Canyon to Twin Arrows (milepost 214-218) segments.

US 89 Landslide Repairs (near Bitter Springs)
ADOT is scheduled to reopen US 89 south of Page after the highway was closed on Feb. 20, 2013 after a landslide caused serious damage to the highway near the Echo Cliffs. Major work on the repairs began on Aug. 11, 2014 as crews began excavating nearly one million cubic yards of rock near the highway to build a buttress, which will stabilize and reinforce the mountain slope that carries the roadway. The $25 million repair project remains on target to reopen to traffic this spring, in advance of this summer’s tourism season in Page and Lake Powell.

Southern Arizona

US 60 Widening (Silver King/Superior Streets)
This spring, ADOT is expected to start a project to convert the last remaining two-lane roadway segment on US 60 between Phoenix and Superior into a modern, four-lane divided highway. The $45 million project (mileposts 222-227), which will also include improving the urban section of highway in Superior, is expected to take two years to complete.

US 95 Fortuna Wash Bridge
Leading with a bridge project first, this $13.5 million project is part of a larger corridor improvement project for US 95, the north and south corridor between Yuma and Quartzsite. US 95 is also the main route to the Yuma Proving Ground, which is one of the largest employers in Yuma County and one of the Army’s busiest training sites in the U.S. This project includes a bridge over Fortuna Wash, which often floods during heavy rains. This project is scheduled to begin in the spring.

US 95 San Luis Street Improvements
This $11 million project includes reconfiguring San Luis Port of Entry traffic off US 95 in San Luis to facilitate business along Main Street. The project, which began in October 2014, will help the circulation of traffic, enhance pedestrian safety and improve access to downtown businesses near the U.S.-Mexico international border. Work will be completed this year.

Major Studies

Interstate 11
ADOT’s Interstate 11 and Intermountain West Corridor Study continues to move forward. This year, work will begin on an Environmental Impact Statement which will allow ADOT to begin an environmental study in the area between Nogales and Wickenburg, part of the proposed Interstate 11 and Intermountain West Corridor. The $15 million Tier 1 Environmental Impact Statement is expected to take three years to complete, once work gets underway later this year. Interstate 11, which will connect Arizona to the entire Intermountain West, is one of our state’s Key Commerce Corridors. I-11 is being planned as a multimodal freight corridor and a manufacturing belt that will drive trade, commerce, job growth and economic development while facilitating strong connections to other major markets.
Passenger Rail
The next major step for ADOT’s Passenger Rail Corridor Study: Tucson to Phoenix is to publish the Draft Environmental Impact Statement for public review. Three public hearings will be held later this year in Maricopa, Pinal and Pima counties to allow community members to comment on the recommendations of the study. Following the public review process, the final recommendations and environmental considerations will be issued on the Final Environmental Impact Statement for federal approval. ADOT is currently evaluating three final rail alternatives. The Passenger Rail Corridor Study is expected to be completed later this year. ADOT’s mission is to evaluate and implement modes of transportation to provide a well-balanced, flexible transportation system that moves people and commerce throughout Arizona.

ADOT PD and INVEST PD

The key to ADOT’s INVEST PD scoring methodology was the assumption that traditional project development could be scored through the INVEST sustainable PD criteria. Once that assumption was established the project team reviewed through scoring training, project scoring and individual scoring the key entry points to examine the ADOT PD process and the INVEST PD criteria. As it turned out this process and approach was relatively seamless and reflected how even INVEST version 1.0 could be easily be adopted into a transportation setting.

Overall, the ADOT methodology attempted to establish and understand what the project team viewed as three separate levels: standard design and PD processes, current best management practices, and new sustainable objectives – where efforts went above and beyond. This methodology created a platform for multiple users to assess their sustainability efforts under one recognized approach. The tool was evaluated in terms of both how the criteria would apply to a variety of development projects specifically the installation of new roundabouts, as well as, where the tool would be best housed within a department of transportation at the state and/or local government level. Through the use of this method, ADOT was able to establish the full extent of the PD module and normalize how INVEST would be utilized.

Scores of the fifty (50) projects

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<td>Not Rated</td>
<td>19</td>
<td>38%</td>
</tr>
</tbody>
</table>

Two items need clarification – some of the early projects in the assessment were scored while the team was still learning the tool. Some of the later projects were scored with a greater understanding of the tool and processes and under INVEST v1.1.
Chapter 3: ADOT Project Development Findings & Recommendations

“Increased access to information has transformed the paradigm of ‘control and isolation’ of information...into the current one of ‘engagement and partnerships’ between innovators for innovation creation.” (16)

Free online easily accessible applications such as INVEST will undoubtedly become a common occurrence in years to come in many areas of business beyond the transportation industry. The tool and ones which will resemble it in the future allow the user to broaden his/her horizons to a scope of work which otherwise would have been beyond his/her knowledge or capacity to fully evaluate. The initiation of a new thought process, sparking of communication across multiple disciplines or agencies and the flexible yet simple nature of the tool showcase the reasoning to implement such an application into routine. With both a greater social and national focus on improving efficiency and promoting sustainability, INVEST is an opportunity for the transportation realm to push itself forward in achieving a more socially, fiscally and environmentally acceptable product.

Internal promotion of a sustainability culture...seemed to be the weakest area for the agencies (DOT’s). The report stated three key findings, “(a) the importance of process, in addition to content, in the strategic planning process; (b) integration between sustainability policies and implementation; and (c) internal communication of the need for and nature of change (18).

Though many states and local public agencies are encouraging and implementing sustainability plans or efforts, translation to all levels within the department has continued to be a challenge. As experienced in ADOT, it is easy for multiple disciplines to focus on their area of expertise, missing the big picture of leading sustainably functioning end product. INVEST has the aptitude to ensure all those who have a direct correlation to the project are able to view and inquiry about other areas which may overlap or dictate their area of design. This in itself promotes an internal thought process which otherwise would have been unexploited. Through the use of the tool, ADOT has made inroads into better understanding the sustainability playing field as it encompasses transportation systems. This example along with the local public agencies involved in ADOT’s training opportunities serve as a prime example of the use of such an application will drive essential forward thinking.

The Value INVEST Added to ADOT:

- Connects sustainability principles to actual ADOT activities
- Measures sustainability specifically for transportation
- Helps stakeholders in the industry go above and beyond
- Introduce all these concepts and perpetuate them into activities
- Identified ways to appropriately use these types of tools
- New standard in life-cycle assessment (LCA), design considerations, sustainable consideration gap analysis
- Allowed organizational entry points

INVEST Direct
- ADOT Statewide Project Management training
• ADOT Environmental Planning Group training
• Arizona Local Public Agency outreach training
• Score fifty (50) ADOT construction program projects
• ADOT & sustainability improved understanding
• State DOT national leadership opportunities
• ADOT INVEST grant #1 final report finalized
• ADOT MPD INVEST System Planning (SP) reintroduction
• ADOT INVEST grant #2 Operation & Maintenance (OM) started

INVEST Indirect
• ADOT State Engineer’s Office monthly activity briefings
• Local Public Agency partnering tool
• ADOT INVEST PD case studies (ADOT & City of Sedona, AZ)
• State University outreach development
• Wider ADOT sustainability proliferation (Executive Management, Design, Roadway, District, and other State DOT knowledge sharing)
• ADOT/USGS partnership development on water issues
• ADOT Excellence Award Program

ADOT is very proud of INVEST as a collaborative tool. It far exceeded what was originally envisioned. The tool provided essential insight in determining the extent of our current best management practices, identified areas in which ADOT excels and where gaps exist. It also created an exceptional opportunity to partner not only within our agency but magnify the conversation to outside stakeholders. Since the beginning of our evaluation in early 2013, ADOT has coordinated multiple in house training opportunities spanning several disciplines such as Project Management, Materials Group and Environmental, as well as, continues to provide online training and discussion based forums across the state to aid multiple levels of government in utilizing the tool.

INVEST not only led to a more substantial, sustainable design, but also aided in furthering lines of communication among members of ADOT. It sparked new natures of discussion which ultimately led to all individuals involved learning more about various aspects of the development process. This type of learning opportunity is and will continue to be essential in ensuring timely and effective project delivery. INVEST was irrefutably acknowledged as a beneficial tool which may continue to broaden lines of discussion, facilitate essential communication and lead to further modernization of design.

**ADOT INVEST Project Development Scoring Summary by Criteria**

The PMT found many lessons learned to further pursue. The highest recommendations are included for each criteria below:

**PD-1 Economic Analyses**
Work with ADOT’s Multimodal Planning Division to tie together these types of analyses.

**PD-2 Life-Cycle Cost Analyses**
Specific focus on sustainable pavement systems will be conducted during the 2015 INVEST O&M effort.
PD-3 Context Sensitive Project Development
A key success area for ADOT – further CSS efforts by incorporating INVEST.

PD-4 Highway and Traffic Safety
A new statewide safety program update is underway and should include sustainability

PD-5 Educational Outreach
Continue the ADOT INVEST Local Public Agency outreach effort.

PD-6 Tracking Environmental Commitments
Conduct discussions with this group during the 2015 O&M effort.

PD-7 Habitat Restoration
A key success area for ADOT – continue to seek new ways for restoration.

PD-8 Stormwater
Integrate sustainability and INVEST criteria into the stormwater program

PD-9 Ecological Connectivity
A key success area for ADOT – continue to seek new ways for wildlife crossings.

PD-10 Pedestrian Access
A new Complete Transportation Guidebook is underway should include INVEST.

PD-11 Bicycle Access
A new Complete Transportation Guidebook is underway should include INVEST.

PD-12 Transit & HOV Access
Integrate INVEST into the project scoping and project development phases.

PD-13 Freight Mobility
Continue to recognize freight mobility as a sustainable driver.

PD-14 ITS for System Operations
Seek ways to integrate ITS for system health including Weigh-in-Motion technology.

PD-15 Historical, Archaeological, and Cultural Preservation
A key success area for ADOT – continue to seek new ways for INVEST integration.

PD-16 Scenic, Natural, or Recreational Qualities
Work with natural environment stakeholders to integrate their own sustainability drivers.

PD-17 Energy Efficiency
Conduct discussions with this group during the 2015 O&M effort.

PD-18 Site Vegetation
A key success area for ADOT – continue to seek new ways to share with other State DOTs.

PD-19 Reduce and Reuse Materials
Incorporate improved waste management guidance into the Standard Specifications for Road and Bridge Construction

PD-20 Recycle Materials
Incorporate improved waste management guidance into the Standard Specifications for Road and Bridge Construction

PD-21 Earthwork Balance
ADOT Sustainable Earthwork Plan (ASEP) INVEST Case Study (May 2015 start)

PD-22 Long Life Pavement Design
Specific focus on sustainable pavement systems will be conducted during the 2015 INVEST O&M effort.

PD-23 Reduced Energy and Emissions in Pavement Materials
Specific focus on sustainable pavement systems will be conducted during the 2015 INVEST O&M effort.
PD-24 Contractor Warranty
   Develop framework to discuss this area with ADOT executive management.
PD-25 Construction Environmental Training
   New training programs are currently under development.
PD-26 Construction Equipment Emission Reduction
   Develop framework to discuss this area with ADOT executive management.
PD-27 Construction Noise Mitigation
   Develop framework to discuss this area with ADOT executive management.
PD-28 Construction Quality Control Plan
   Develop framework to discuss this area with ADOT executive management.
PD-29 Construction Waste Management
   Incorporate improved waste management guidance into the Standard Specifications for Road and Bridge Construction.
Chapter 4: Other Current ADOT Sustainability Efforts


The ADOT MPO/COG Guidelines and Procedures Manual is intended to be a resource document to assist in outlining how the ADOT Multimodal Planning Division (MPD) conducts regional transportation planning and program administration.

In every part of Arizona, the regional planning agencies, in cooperation with ADOT, have an important role in planning and coordinating transportation projects. ADOT's planning partners often are responsible for facilitating the project process between local communities, public transit providers and ADOT. This manual provides guidance related to the planning processes and administrative requirements when facilitating transportation planning activities. The goal of this manual is to clarify roles and responsibilities, improve efficiency among organizations and reduce questions and potential conflicts.

Chapter 17.11 Sustainability of the Manual is included in the Appendix

Julie Ann Wrigley Global Institute of Sustainability/Arizona State University

The Julie Ann Wrigley Global Institute of Sustainability is the hub of Arizona State University’s sustainability initiatives. The ASU Wrigley Institute advances research, education, and business practices for an urbanizing world. Its School of Sustainability, the first of its kind in the U.S., offers transdisciplinary degree programs focused on finding practical solutions to environmental, economic, and social challenges.

The Mission

Arizona State University established the ASU Wrigley Institute to:

- Articulate and exemplify Arizona State University’s university-wide commitment to sustainability
- Actively support and encourage Arizona State University units and their partners in the teaching, learning, and discovery of sustainability
- Implement, extend, share and promote sustainable practices locally, nationally, globally
- Connect scientists, scholars, humanists, engineers, technologists, policymakers, business leaders, students and communities to enhance the capacity to address challenges of sustainability

As part of ADOT’s INVEST PD grant effort, the project team developed a pilot university outreach effort. This initial effort took the form of a joint case study project in connection with the School of Sustainability and the Julie Ann Wrigley Global Institute of Sustainability both housed at Arizona State University. In the Fall of 2014 the school held their Urban Sustainability: Best Practices/Case Studies graduate class. ADOT sought to achieve three goals: deepen the topic of transportation at the university programs level, formalize transportation and sustainability linkages at the university level, and introduce the interesting technical and scientific puzzles found in State DOT program to students.
Historic US 60 Queen Creek Tunnel Light-Emitting Diode Project

In an ongoing effort to address life cycle costs of the state’s highway system, the Arizona Department of Transportation recently secured a $1 million federal grant to replace the antiquated lighting in the US 60 Queen Creek Tunnel (originally built in 1952) near Superior with a new light-emitting diode (LED) lighting system. This will be the first tunnel in Arizona to have the new innovative technology.

The new lighting system will improve visibility in the tunnel, which was, by using an adaptive control system that will adjust the lighting level within the tunnel based upon ambient light and weather conditions outside the tunnel.

The new lighting system will significantly reduce the power consumption, while decreasing maintenance frequency for the tunnel (reduction in lane closures, traffic delays). “This project is one of several in store for the US 60 corridor that will ultimately enhance safety between Globe and the Phoenix metro area, including the Silver King/Superior Streets widening project west of the Queen Creek Tunnel and the Oak Flats climbing lane project east of the tunnel,” said ADOT Globe District Engineer Jesse Gutierrez. “The new lighting system will provide sufficient visibility in the tunnel for safety while using the least amount of energy.”
The funding was awarded from the Federal Highway Administration Accelerated Innovation Deployment Demonstration program which will ultimately invest $30 million in incentive funding for federal, state, local and tribal government agencies to hasten their use of innovative methods. The AID program builds on the success of the agency’s ongoing Every Day Counts initiative, a partnership between the Federal Highway Administration and state and local transportation agencies to accelerate the deployment of innovative methods and cut project delivery times.

ADOT expects to replace the lighting system fall 2015, which will require new conduit and wiring in the quarter-mile-long tunnel. The total project cost is estimated to be $4.2 million. ADOT was one of only six states to receive one of the grants designed to accelerate deployment of innovative transportation projects.

**ADOT Quiet Pavement Program**

A three-year, $34 million project to surface about 115 miles of Phoenix-area freeways with rubberized asphalt is working toward a smoother ride for motorists and quieter neighborhoods for those who live adjacent to the roads.

The first areas to receive the “quiet pavement” were on the Loop 101 Agua Fria Freeway from Union Hills Drive to 31st Avenue, and on the Loop 101 Pima Freeway from 21st Avenue to Tatum Boulevard and from Frank Lloyd Wright Boulevard to Mountain View Road. State Route 51 was resurfaced from Shea Boulevard to Bell Road. The entire Loop 101 and SR 51 freeways plus sections of Interstate 10, Interstate 17 and the Loop 202 Red Mountain and Santan freeways will also receive new rubberized asphalt surfaces.
**What Is Rubberized Asphalt?**

Rubberized asphalt has been used for more than 20 years to resurface highways and city streets in Arizona when pavement surfaces reach their normal life expectancy. While it helped reduce the disposal of used tires, it recently has been recognized for its reduction of traffic noise.

**Description of Rubberized Asphalt**

Rubberized asphalt consists of regular asphalt paving mixed with “crumb rubber” which is ground, used tires that would otherwise be discarded or take up space in landfills. Used tires are processed by separating the casings, fabric and steel. The extracted rubber then is pulverized to the consistency similar to that of ground coffee. Rubberized asphalt has the benefit of being smoother and quieter. Noise readings have shown the rubberized asphalt generally reduces tire noise by an average of 4 decibels.

Approximately 1,500 tires are used for every lane-mile of rubberized paving, which can put a major dent in the 2 million used tires that are generated annually in Maricopa County.

**Rubberized Asphalt Is Temperature Sensitive**

Rubberized asphalt cannot be applied during cold weather or very hot weather. The concrete pavement surface needs to be between 85 and 145 degrees Fahrenheit for the material to adhere properly. So rubberized asphalt can only be applied in the spring and fall in the Phoenix area, from March 15 to May 31 and from September 1 to November 15. Prior to application, contractors must repair pavement cracks, chips and joints and prepare the concrete surface for the rubberized asphalt overlay.

**Financing**

The Quiet Pavement Program was developed by ADOT in cooperation with the Maricopa Association of Governments (MAG) and area cities. It will be completed over a three-year period and funded using $34 million from other regional projects.

**Building a Freeway: Rubberized Asphalt**

[http://azdot.gov/media/blog/posts/2013/07/26/building-a-freeway-rubberized-asphalt](http://azdot.gov/media/blog/posts/2013/07/26/building-a-freeway-rubberized-asphalt)

**Rubberized asphalt reduces noise, helps environment**


**ADOT State Engineer’s Office Activity Briefings**

In order to introduce, inform and educate ADOT’s current executive leadership first about the goals of launching the sustainability efforts and subsequently the ongoing integration process, the sustainable project management team introduced the idea of providing a monthly update. This update was proposed to take the form of an activity journal consisting of a two page maximum document. The journal had to, in its brevity, outline the challenges and opportunities that these new efforts would encounter, leverage the time the briefing would be in front of executive management, and be sensitive to introducing new concepts into legacy State DOT
operating dynamics in such a short document. The project team was fortunate to have a responsive State Engineer Office, who met one on one to discuss the first two monthly submittals. Thus, ensuring the product served its intent, yet remained a quality quick reference document for decision makers.

The activity journals also attempted to be a communication tool between technical, scientific staff working on the projects and the decision makers at ADOT. The format for the documents, which have progressed over the seven months of its use, are personally tailored to both update ongoing multi-month efforts and serve as an announcement forum for new directions and projects. It has been especially useful as an outline for the quarterly, in-person State Engineer Office meetings. In conjunction with the monthly journals and the quarterly in-person updates, this process has afforded the project management team opportunities to now build a format to update all the Intermodal Transportation Division senior program managers that meet quarterly at what is referred to as the Future Focus Meetings.

ADOT Excellence in Advancing Sustainable Project Development Award Program

What: New sustainable project development award program for the districts and project development groups.

- Award program approved September 2014
- Award committee established (Paul O’Brien, Steven Olmsted, Emily Lester)
- Standardized ADOT / INVEST Score methodology established to clearly support award

Methodology

- INVEST Score 50%
- Best Management Practices (above and beyond) 30%
- Collaborative Efforts 20%

- Quarterly meeting held to approve award recipient
- Committee to meet quarterly

First Project Receiving Award

Prescott District
State Route 89 & Perkinsville Roundabout Project
089 YV 329 H8330 01C

The Federal Highway Administration (FHWA) and the Arizona Department of Transportation (ADOT) are planning to construct a new roundabout at the intersection of SR 89 and Perkinsville Road between milepost (MP) 329.27 and MP 329.46 in the town of Chino Valley in Yavapai County, Arizona.

The scope of this project would include:
- Removing the existing pavement from SR 89 and Perkinsville Road in the project area
- Constructing a new two-lane elliptical roundabout at the intersection of SR 89 and Perkinsville Road
- Reconstructing SR 89 and Perkinsville Road in the project area to align with the newly constructed roundabout
- Adjusting or relocating adjacent driveways / business access as needed
- Installing new roadway striping and signs
- Removing or reconstructing drainage culverts, where needed, and installing new culverts, stormwater catch basins, and other drainage improvements
- Constructing new pedestrian crossings
- Reconstructing sidewalk at intersection
- Constructing new curb and gutter around the new roundabout
- Adjusting or relocating existing utilities
- Installing new roadway lighting
- Conducting geotechnical investigations

Why it earned the award

The Federal Highway Administration (FHWA) Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) Implementation Program has been and continues to be a valuable opportunity for ADOT to acquaint itself with an accessible and comprehensive platform for assessing programs and practices using a holistic sustainability lens. INVEST has already helped ADOT’s INVEST working group to validate strategic directions, increase knowledge across core functions and advance a decision-making framework around sustainability best practices. Roundabouts are becoming a cornerstone of traffic safety and congestion management, so it is critical to have a thorough understanding of how future implementation and development directly impact communities’ social, environmental and economic systems. In Arizona, at both the state and municipal level, roundabouts have become a popular option in traffic intersection design/development/safety.
To appropriately blend ADOT’s roundabout design criteria, and the parameters in which roundabouts would fit inside the INVEST tool, the project team started with these nine (9) objectives:

- Apply the project goals the Town, the public, the regional planning organization, and the assigned ADOT district developed in connection with this project.
- Identify how the roundabout would promote and enhance growth given the traffic needs of an economically developing area.
- Design the basic dimensions of the roundabout while fitting within the available right-of-way.
- Recognize the variables involved in construction of this roundabout and then identify the related sustainability criteria.
- Consider the impact of commercial truck thru traffic, local commercial truck traffic and commercial business at the intersection that utilized trucks in their operations.
- Integrate the overall FHWA sustainable highway’s goals and ADOT’s INVEST project.
- Stress implementation of sustainable practices and gain project champion’s consensus.
- Make wise investment decisions with limited resources.
- Encourage changes in professional practice and go beyond compliance.

The project went above and beyond when scored through the INVEST tool and of particular note, in addition to the safety elements, was the freight mobility component.

**INVEST PD-13: Freight Mobility**
**Goal**
Enhance mobility of freight movements, decrease fuel consumption and emissions impacts, and reduce freight-related noise.

**Sustainability Linkage**
Enhancing freight mobility supports the environmental and economic sustainability principles by providing features that make freight transportation more efficient, thereby reducing fuel consumption, decreasing emissions, and reducing noise pollution.

**Scoring Requirements**
Facilities installed for this requirement shall be consistent with the need, purpose, and appropriateness for freight mobility within the project footprint.

**Second Project being considered May 2015**

*Statewide Project Management*  
**US 60, Silver King & Superior Streets**  
**060 PN 222 H7900 01C**

An environmental assessment (EA) for improvements to the segment of US Highway 60 (US 60) between Florence Junction (the US 60 and State Route [SR] 79 intersection) at milepost (MP) 211.70 and the intersection of US 60 and SR 177 at MP 226.85 was originally documented in the
Final Environmental Assessment and Section 4(f) Evaluation: US 60 – Florence Junction to Superior (Federal Highway Administration [FHWA] Federal Aid Number STP-060-D(AAA), Arizona Department of Transportation [ADOT] Project Number 060 PN 212 H4662 01L). The Finding of No Significant Impact (FONSI) for this EA was signed by FHWA on March 22, 2004.
Scope of Work

The Silver King and Superior Streets segment begins at MP 222.14. The Queen Creek EB Bridge (MP 222.25, Structure 2847) will be protected in place and the Queen Creek WB Bridge (MP 222.25, Structure 296) will be demolished and replaced. At the approximate location of the existing Hewitt-Station Road intersection (MP 222.45), the new alignment of US 60 will diverge from the existing alignment and will be constructed as four-lane divided highway north of the existing alignment. A new intersection will be constructed along the new alignment at approximately MP 222.70 to replace the access for Hewitt-Station Road and to provide access to Boyce Thompson Arboretum. The existing portions of US 60 that will be bypassed by the realignment will remain in-place to provide local access to the Arboretum and local residences. A cul-de-sac will be constructed on the east terminus of the bypassed segment of US 60; local access will only be provided on the west end at MP 222.70.

The new alignment of US 60 will require new bridges to be constructed over Happy Camp Wash (approximate MP 222.95) and Silver King Wash (approximate MP 223.95). The new alignment will also overlap portions of the Magma Railroad and El Paso Natural Gas/Kinder Morgan rights-of-ways. No changes are necessary to the Railroad, but portions of the buried El Paso Natural Gas/Kinder Morgan pipeline will be relocated to eliminate conflicts with the new US 60 alignment. The new alignment will converge with the existing alignment at approximately MP 224.10. At the convergence, the existing US 60 roadway will be reconstructed as westbound (WB) US 60 and a parallel roadway to the south will be constructed to serve as eastbound (EB)
US 60. Improvements will be made to existing No Name Wash Bridge (MP 224.64, Structure 319) and a new bridge will be built at this location for the new EB roadway. At approximately MP 225.08, the divided roadways will merge together to form a 5-lane urban cross-section roadway. The existing US 60 will undergo:

- Widening and dividing the roadway
- Realignment of existing roadway
- Extensive utility relocation
- A massive archaeological effort
- Redevelopment of the downtown roadway

The additional travel lanes will also mitigate the existing vertical clearance concerns. The roadway improvements will tie into the existing US 60-SR 177 traffic interchange exit and entrance ramps at the east project terminus. The INVEST scoring identified earthwork balancing, cultural involvement, tribal involvement, run off containment and safety as having gone above and beyond.

**Award Consideration – Above and Beyond for final design and construction**

Silver King Section and Superior Streets – Scored Dec 16, 2014

**Module:** Project Development  
**Scorecard:** Urban Extended  
**Points:** 53  
**Achievement Level:** Silver

**Notable PD Criteria**

**PD-03 Context Sensitive Project Development**  
Deliver projects that harmonize transportation requirements and community values through effective decision-making and thoughtful design. This project achieved one of the highest levels of partnering possible for an ADOT road project.

**PD-04 Highway and Traffic Safety**  
Safeguard human health by incorporating science-based quantitative safety analysis processes within project development that will reduce serious injuries and fatalities within the project footprint. This realignment effort allowed improved safety most notably in the Town of Superior limits.

**PD-15 Historical, Archaeological, and Cultural Preservation**  
Preserve, protect, or enhance cultural and historic assets, and/or feature National Scenic Byways Program (NSBP) historic, archaeological, or cultural intrinsic qualities in a roadway. This project included a $6 million archaeological recovery effort.
PD-29 Construction Waste Management
Utilize a management plan for road construction waste materials to minimize the amount of construction-related waste destined for landfill. A minimum of 50,000 cubic yards of waste has been strategically accounted for and assigned for disposal at a locally located mining pit.

Sustainability Process Integration Mapping
The PMT desired to move from the baseline flow chart developed during the initial INVEST PD rollout and subsequent scoring to a diagram that reflected the whole universe of activities or documents that might fall under the integration of a sustainable program into ADOT existing processes. This was the diagram initially developed:

The current ADOT Sustainability Process Integration Map can be found in Appendix A-3. It attempts to identify the sustainability process that evolved from years 2012 – 2015. It is also being utilized as one of the PMT’s handout documents to share and educate how many of the most familiar ADOT activities and documents are captured through a sustainability lens.

Complete Transportation Guidebook
What is complete transportation?
Transportation is not an end in itself—it is a means to participate and respond to the economy, while being mindful of the natural environment and considering the wider social context these activities influence. This concept aligns seamlessly with the INVEST tool criteria. Historically, the role of a state DOT has been to build, operate, and maintain a highway system focused on roadway capacity. Today, ADOT is evolving its mission and goals to be more agile in how it develops and maintains the transportation system in Arizona.

Many state departments of transportation (DOTs) have developed state-specific tools and resources to help them make investments in transportation infrastructure that reflect these concepts. The Arizona Department of Transportation (ADOT) laid the groundwork for smart transportation from a statewide perspective in 2009 with the Building a Quality Arizona (bqAZ) Transportation Planning Framework, which established a vision for linking transportation with
land use, the economy, and the natural environment. *What Moves You Arizona*, the 2011 statewide long-range transportation plan, continued this vision by committing increased funding to non-highway modes. The ADOT Research Center’s report State Planning and Research (SPR) 618, *Land Use and Traffic Congestion*, showed that urban corridors with a mix of land uses, multimodal opportunities, and a secondary street grid networks have considerably less congestion than suburban corridors. These plans and reports establish a foundation ADOT can build upon to implement transportation concepts and select the best practices that will eventually become ADOT’s way of doing business. The INVEST project has elevated the conversation on how all of these concepts fit together at ADOT and has put a premium on disseminating redundancies within all of these newer concepts. ADOT determined that it was time to develop an appropriate, user friendly guidebook for planners, designers and stakeholders that would communicate ADOT’s position and tools on these topics. The evolution of the ADOT Complete Transportation Guidebook is occurring during 2015 and will allow for the maturing sustainability process integration to both support this guidebook but also be included inside of it as one of the tools available for consideration during the planning and development efforts.

**The Guidebook Outline**

Proposed Name: *Complete Transportation Guidebook*

Why:
Title 23 - Highways
Chapter I - FEDERAL HIGHWAY ADMINISTRATION, DEPARTMENT OF TRANSPORTATION
Subchapter E - PLANNING AND RESEARCH
Part 450 - PLANNING ASSISTANCE AND STANDARDS
Subpart B - Statewide Transportation Planning and Programming
Section 450.214 - Development and content of the long-range statewide transportation plan

(a) The State shall develop a long-range statewide transportation plan, with a minimum 20-year forecast period at the time of adoption that provides for the development and implementation of the multimodal transportation system for the State. The long-range statewide transportation plan shall consider and include, as applicable, elements and connections between public transportation, non-motorized modes, rail, commercial motor vehicle, waterway, and aviation facilities, particularly with respect to intercity travel.

Therefore, a guidebook would be a substantive tool to support ADOT’s Section 450.214 requirement and provide ADOT planners and designers, stakeholders, citizens, affected public agencies, representatives of public transportation, private providers of transportation, representatives of users of public transportation, representatives of users of pedestrian walkways and bicycle transportation facilities, outside engineering firms, other interested parties that may have land use, economic development or transportation interests a reasonable understanding of how the wider social and citizen aspects of planning and project development are handled at ADOT.
How:
The framework would define how ADOT can participate and foster:

- The connection of transportation projects and programs to public and private investments so they complement the wider economic, social and environmental goals
- The development of a wider range of strategies and tools to ensure the integration of land use, economic development and transportation planning occur in a coordinated manner
- That the full consideration of mobility, accessibility and context sensitive solutions for all users is considered when creating or rehabilitating transportation facilities

Goal:
Gather and synthesize existing material, key on commonly recognized ADOT and national categorical trends (FHWA Sustainable Highways, INVEST, ADOT Excellence in Advancing Sustainable Project Development Award Program, ADOT Key Commerce Corridor initiatives, Complete Streets, Statewide Bicycle and Pedestrian Planning, Safe Routes to School etc.) and compile a guidebook. This effort would fill a desktop reference gap that documents and connects ADOT’s partnering, planning and designing commitments with the goals of the people who live, work and travel on our transportation system.

Environmental Green Shop Award Program

Since 2008, ADOT has implemented an effective environmental workplace management recognition and incentive program called the Environmental Green Shop Award Program. The Program offers next generation, environmentally-proven vehicle service and repair management. The goals are to continue ‘green’ operational practices and promote environmental stewardship throughout the twenty-two (22) vehicle service and repair shops to even higher standards for environmental management and workplace safety. An ‘environmentally friendly’, ‘green’ workplace includes efforts to encourage employees to reuse, recycle, conserve energy, water, consumables, and petroleum fuel use, activities in pollution prevention, minimizing waste and emissions, source reduction, solid waste to landfills, and increase sustainability through best management practices. The Program empowers employees to go ‘above and beyond’ to make a meaningful difference by engaging employees as ‘green shop teams’ to implement and improve environmental sustainability which is both good for business and the planet. A ‘green’ shop has evaluated the impact of its operations on the environment and then adopted specific practices intended to minimize waste generation, maximize recycling, conserve energy, and protect customers and employees. ADOT has been recognized by others in our industry as a true leader in the sustainability field and leads the transition from a disposal-based business to one that recycles as a first response.

The Environmental Green Shop Award Program provides continual improvement in the development and support of environmental solutions that increase collaboration and productivity of the workforce, increase profit and sustainability, manage environmental operations, metrics and indicators to measure progress, and recognize and award the top ‘green shop teams’ to let the teams know just how much the agency respects their efforts and how much initiative it takes to go ‘above and beyond’. Equipment shops look to the Program as a way to save money and improve individual shop sustainability, as well as, agency sustainability
simultaneously. In addition, employees participate in an environmental activity that rewards the ‘top shop’ for the commitment to being great stewards of the environment and are inspired to go above and beyond.

**Sustainable Earthwork Plan – ADOT INVEST Case Study (June 2015 start)**

ADOT will be undertaking a case study in 2015 to understand if there are sustainable entry points or process improvements that can be gained above and beyond the mature guidelines and earthwork construction activities already in use. The case study will use the INVEST PD-21 and ADOT Roadway Design and Construction Guidelines as a framework for assessment.

**Action**
- Sustainable Earthwork Plan format identified
- $50m H7900 Superior Streets project used as a pilot project
- Documenting, photographing earthwork and blasting work, rough out earthwork BMPs,
- Evaluate the sequence from Stage I to Stage V design plans, and compare to actual field determinates
- Possibly adapt FHWA’s Construction and Maintenance GHGe Estimator Tool to process

**INVEST PD-21 Earthwork Balance**

**Goal**
Reduce the need for transport of earthen materials by balancing cut and fill quantities.

**Sustainability Linkage**
Balancing cut and fill quantities in a project supports the environmental and economic sustainability principles by reducing the environmental and economic costs associated with the transport of earthen materials.

**Scoring Sources**
The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

- Grading plan, reporting total cut and fill quantities and total miscellaneous cut/fill.
- Inspector or Contractor’s actual construction earthwork volumes for the project, including actual cut and fill, volume of unused embankment materials, and volumes of imports to and exports from site.

**ADOT Roadway Design and Construction Earthwork Guidance**

Earthwork is an important component of project design and may form the primary activity for the construction of a new highway. There are two initial concerns that relate to earthwork:

**Earthwork Balance**
Typically, roadway designers seek to balance cut (excavated soil) and fill (soil placed as embankment). Earthwork balance involves calculations to estimate the shrink (amount of
volume reduction associated with handling and placing soils) or swell (amount of volume expansion usually associated with rock).

Because it is very expensive to import additional material to the project site, designers usually incorporate excess excavation into their earthwork calculations as a project-specific percentage of the overall effort. It will be necessary to “waste” this excess excavation if not used for construction of the roadway (wasting will be described below in greater detail). For projects involving large volumes of earthwork, consider a smaller percent of that earthwork when calculating the excess material.

**Excess Excavation (Waste)**

During the design process, consider the storage and handling of any excess excavation (waste) that may be generated during construction.

- Are there areas within the project limits in which the waste can be utilized to better integrate the highway corridor with the surrounding landscape? Both aesthetic and environmental benefits should be considered. For example, fill slopes may be made flatter using this waste material, *Figure 4.8*. This may be especially appropriate on the uphill side of an embankment where depressions can appear out of place in the landscape. Waste material may also be used to construct “false cuts” at the tops of fill slopes.
- Is it possible to reduce the volume of waste by means of retaining walls? (Retaining walls will be discussed later in this chapter.)
- Is it possible to reduce waste by adjusting the vertical alignment of the highway?
- Are there areas (both within and outside the project limits) that are less visible where excess material can be placed?
- May waste be utilized on an existing roadway that will be obliterated?
- Does BLM, USFS or local public agencies anticipate the future construction of projects that can utilize the material such as trailhead- or overlook-parking areas?
- If the project is one of a series within a larger corridor, consider utilizing sites to be disturbed by future phases within that corridor.
ADOT Roadside Development Section

The Roadside Development Section provides landscape, architectural and environmental expertise for ADOT projects statewide. Technical direction and expertise include development of plans, specifications and review of consultant plans involving aesthetic enhancements, design, landscape restoration, stormwater and erosion control, seeding and revegetation, native plant salvage and replanting, landscape and irrigation design and administering the statewide rest area program. The Roadside Development Section truly reflects a multi-discipline and multi-jurisdictional approach to transportation sustainability. The Section’s responsibilities address today’s economic realities of long term roadside maintenance and environmental responsibilities. Roadside’s social responsibilities go far beyond the immediate roadside view shed and is best reflected in their administration of the Arizona Parkways, Historic and Scenic Roads (ARS Title 41, Chapter 3, Article 1.3). Specifically, they are responsible for the intrinsic qualities, and project review activities related to Arizona’s nationally recognized National Scenic Byways Program (NSBP) assets (see Appendix).

Since 1992 this group has been responsible for stewarding a native plant only seeding policy within ADOT Right-of-way areas. The Section remains one of the only state DOTs that has developed contract specifications for the control of noxious and invasive plant species and has implemented the requirements on no less than sixty (60) projects to date. The specification requires the contractor to identify and remove any designated invasive or noxious plant species prior to any earthwork activities. Additionally, these requirements have now diversified from just grass seeding for erosion control to now including annual and perennial wildflowers, forbs and shrub options to more closely resemble Arizona’s diversified native roadside vegetation.

Continuing Sustainability Achievements

- Customize seeding specifications to the each unique biological zone (AZ has eight (8) biotic communities)
- Promote establishment of slow release and/or low water soluble seeding
- Develop compost usage to supercharge organic activity and promote establishment
- Eliminate costs associated with low result wood mulch usage and replace with straw applications
- Continue training for seeding inspectors statewide

Project Example - Pinto Creek Bridge

Construction History

The Pinto Creek Bridge carries U.S. Highway 60 over Pinto Creek and Rattlesnake Canyon southwest of Miami, AZ. The bridge is configured as a long-span, two-hinge steel deck arch, with two riveted plate girder arch ribs, each 7% feet in depth. Extending 371 feet from center to center of the pylons and rising 72 feet from the bearing pins, the central arch is flanked by five shorter concrete slab spans on the west and three on the east. Arizona Highway Department engineer, Ralph Hoffman, designed the bridge in the spring of 1946. By 1949, the bridge was complete. Total cost: $460,344. The Pinto Creek Bridge was immense, consuming over 1 million pounds of structural steel, 409,000 pounds of reinforcing steel and almost 3,500 cubic yards of concrete.
The original bridge is now reaching the limits of its service life and ADOT has instituted a project which will replace the bridge with a new structure. The bridge is located on US 60 between the communities of Superior and Globe-Miami. This section of the US 60 corridor is designated by the Department of Transportation as the Gila Pinal Scenic Road. It is a primary commercial and recreational link between the Phoenix metropolitan area and the rural communities of eastern Arizona. It is classified as a Principle Arterial Rural Route.

The existing bridge location does not allow for any easy detours. As such the new bridge must be installed while keeping the original bridge in operation. The new bridge will be constructed directly north of the existing structure. The new location for the bridge will necessitate the realignment of the approaching segments of US 60.

The project is located entirely within the Tonto National Forest. ADOT has been working closely with the Forest Service on the design. It is essential for the bridge to complement and blend with the natural surroundings. The realigned roadway approach sections will be designed to limit impacts to the existing native plant and rock outcroppings. Once the new bridge and roadway is established ADOT will remove the existing bridge and roadway sections. ADOT will re-establish areas near the old bridge and roadway sections through native revegetation and seeding efforts.

**ADOT Interstate 11 - Linking Sustainability and NEPA**

In the summer of 2014, the Arizona and Nevada Departments of Transportation completed the two-year Interstate 11 (I-11) and Intermountain West Corridor Study. Congress recognized the importance of the portion of the Corridor between Phoenix and Las Vegas and designated it as future I-11 in the recent transportation authorization bill, Moving Ahead for Progress in the 21st Century Act (MAP-21). The study included detailed corridor planning of a possible interstate link between Phoenix and Las Vegas, and high-level visioning for extending the corridor south to Mexico and potentially north to Canada. The I-11 and Intermountain West Corridor Study is now complete and points to the need for a new multimodal freight corridor and a manufacturing belt that will drive trade, commerce, job growth and economic development for the two states, as well as, facilitate strong connections to other major regional markets.

ADOT advertised for proposals to complete a federally funded $15 million Tier 1 Environmental Impact Study (EIS) for the proposed expanded portions of the future I-11 and Intermountain West corridor. The Tier 1 EIS is expected to take three years to complete and will start later this year. In meeting with the FHWA Division office on the scope of work for the project ADOT decided to use the FHWA developed INVEST as part of the alternatives screening for the study. INVEST is a tool to evaluate and aid the integration of sustainability into programs and projects and is one of the National Performance Objectives (SP-3) in the FHWA Performance Year 2015 Strategic Implementation Plan. Especially as FHWA develops and subsequently rolls out INVEST v1.2, ADOT will consider advancing innovative scope of work objectives in connection with other environmental activities as an additional format for stakeholder participation and project acceptance.
Accelerated Bridge Construction - Geosynthetic Reinforced Soil Integrated Bridge System - EDC-3 Initiatives (2015-2016) xvii

Through EDC initiative, FHWA works with state and local transportation agencies and industry stakeholders to identify a new collection of innovations to champion every two years. Innovations are selected by stakeholders from across the highway community, taking into consideration market readiness, impacts, benefits and ease of adoption of the innovation. Ultimately, a group of approximately a dozen technologies are selected for promotion under each two-year EDC cycle. Sometimes innovations are held over from the previous round of EDC in order to assure a more thorough deployment nationally.

The announcement of the third round of innovations came on August 28, 2014. Transportation leaders from across the country will gather at regional summits this fall to discuss the EDC-3 innovations and share best practices. These summits begin the process for states, local public agencies and Federal Lands Highway Divisions to focus on the innovations that make the most sense for their unique program needs, establish performance goals and commit to finding opportunities to get those innovations into practice over the next two years.

Geosynthetic Reinforced Soil–Integrated Bridge System xviii

The geosynthetic reinforced soil-integrated bridge system (GRS–IBS) is an innovation for reducing bridge construction time and cost. As an alternative to conventional construction methods, GRS-IBS is an accelerated construction technique for bridge systems that uses alternating layers of compacted granular fill and geosynthetic reinforcement. GRS-IBS technology allows the designer to place the bridge directly on the substructure to create a seamless and smooth transition between the bridge and roadway without using joints, deep foundations, approach slabs or cast-in-place concrete. The closely spaced reinforcement and granular soil create an efficient composite material which is internally stable and capable of carrying bridge loads with predictable performance.

Because of the ease of construction and the use of typical construction equipment and generic materials, GRS-IBS projects can be built in weeks instead of months, which translate into less congestion around work zones.

GRS-IBS technology offers unique advantages in the construction of small bridges:

- It reduces construction time and costs potentially 25 to 60 percent less than conventional methods.
- It is easily built with common equipment and materials. It requires potentially less maintenance because it contains fewer parts than a traditional bridge abutment.
- Its flexible design is easily modified in the field to meet unforeseen site conditions.
- It is capable of withstanding significantly higher loads than typical bridge loads.
- It is environmentally sensitive and produces minimal environmental impacts.

ADOT identified GRS-IBS as a particularly advantageous design option for the smaller system bridges that are reaching the fifty (50) year mark. Working with our FHWA Arizona Office it was determined that “with the recent kickoff of EDC3, FHWA is continuing to actively promote the GRS technology and the goal is to have it be routinely considered on applicable bridge projects. Therefore FHWA welcomes the idea of exploring the GRS-IBS technology for the Cottonwood
Wash Bridge on whether this would be an appropriate candidate,” according to Marissa Romero, FHWA Arizona Office Bridge Engineer. The technology has the potential: To use State Transportation Innovation Council (STIC) funds

- To be a Transportation Engineering Approaches to Climate Resiliency (TEACR) case study
- To apply for Accelerated Innovation Deployment (AID) Demonstration Grant funds
- To increase the federal share payable by 5% for projects that use innovative project delivery

**Conclusion**

ADOT has attempted to develop and implement the INVEST tool not simply to score and measure the projects that are developed on an annual basis, but to use the INVEST tool to build the foundation for an Intermodal Transportation Division sustainability program. It quickly became clear, as the project developed, there was no reason to stop at simply developing a foundation. It was determined that this effort could create new, novel ways to gather the collective knowledge of all ADOT participants in the project development process. The grant allowed ADOT to far exceed the original expectations. It allowed ADOT to explore ways to further analyze opportunities, develop a host of sustainable program initiatives and meet a Triple Bottom Line goal of advancing economic, environmental and social aspects of how ADOT operates.

The concept of constructability for highway projects is as old as the engineering, design and the construction process. Over the years, many organizations including ADOT practiced elements of a constructability program, but did formalize the process with a name. For almost 100 years ADOT and its predecessor, the Arizona Highway Department, submitted plans for review, conducted field reviews and received construction feedback. The problem lies in getting people from diverse cultural backgrounds with potentially different goals to work together effectively. A constructability program in its simplest form integrates common sense design and construction.

Included in the *Fifth Biennial Report of the State Engineer to the Governor of the State of Arizona* for the period July 1, 1920 to June 30, 1922 is a supplemental piece by Thomas H. MacDonald, Chief, U.S. Bureau of Public Roads. In that statement he puts forth the idea that highways should be placed in a self-supporting class. “They are not a luxury nor an incidental, but one of the indispensable facilities to the life in all phases of the nation and the individual.” Keep in mind MacDonald’s comments were just a few years after the establishment of the Federal-Aid Road Act of 1916 which established the fundamental framework in how a Federally-funded, State-administered program might work. We still find today the benefits of instituting approaches to incorporating broad participation of stakeholders. INVEST has clearly shown how ADOT can go above and beyond with its agency’s program and project efforts to further establish standard contributing to good stewardship of public money. Even 100-years since the inception of the Federal-aid program and the inception of the Arizona Department of Transportation transformative approaches can be implemented that allow for the evolution of complete transportation considerations as they exist now.
References


Footnotes

i https://www.sustainablehighways.org/868/what-is-invest.html

ii https://www.sustainablehighways.org/891/why-and-when-would-i-score-a-system-planning-program.html

iii https://www.sustainablehighways.org/900/about-the-project-development-module.html


v NCHRP Project 25-25 TASK 79 - Successful Practices For Effective Tribal Consultation

vi http://ascelibrary.org/doi/abs/10.1061/9780784413197.032

vii http://azdot.gov/planning/transportation-programming/current-program
   http://azdot.gov/planning/transportation-planning


ix http://contextsensitivesolutions.org/content/case_studies/sr_179__village_of_oak_creek_to/

x http://azdot.gov/media/blog/posts/2013/02/06/building-a-freeway-project-development-process


xii https://sustainability.asu.edu/about/about-the-institute.php


xiv http://azdot.gov/business/environmental-planning/programs/quiet-pavement-program

xv http://azdot.gov/business/engineering-and-construction/roadway-engineering/roadside_development/overview

xvi http://i11study.com/wp/

xvii http://www.fhwa.dot.gov/accelerating/edc3.cfm