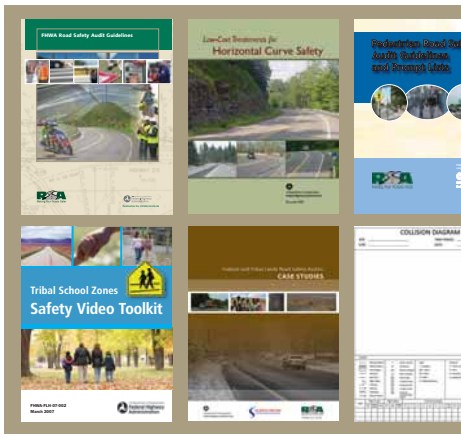
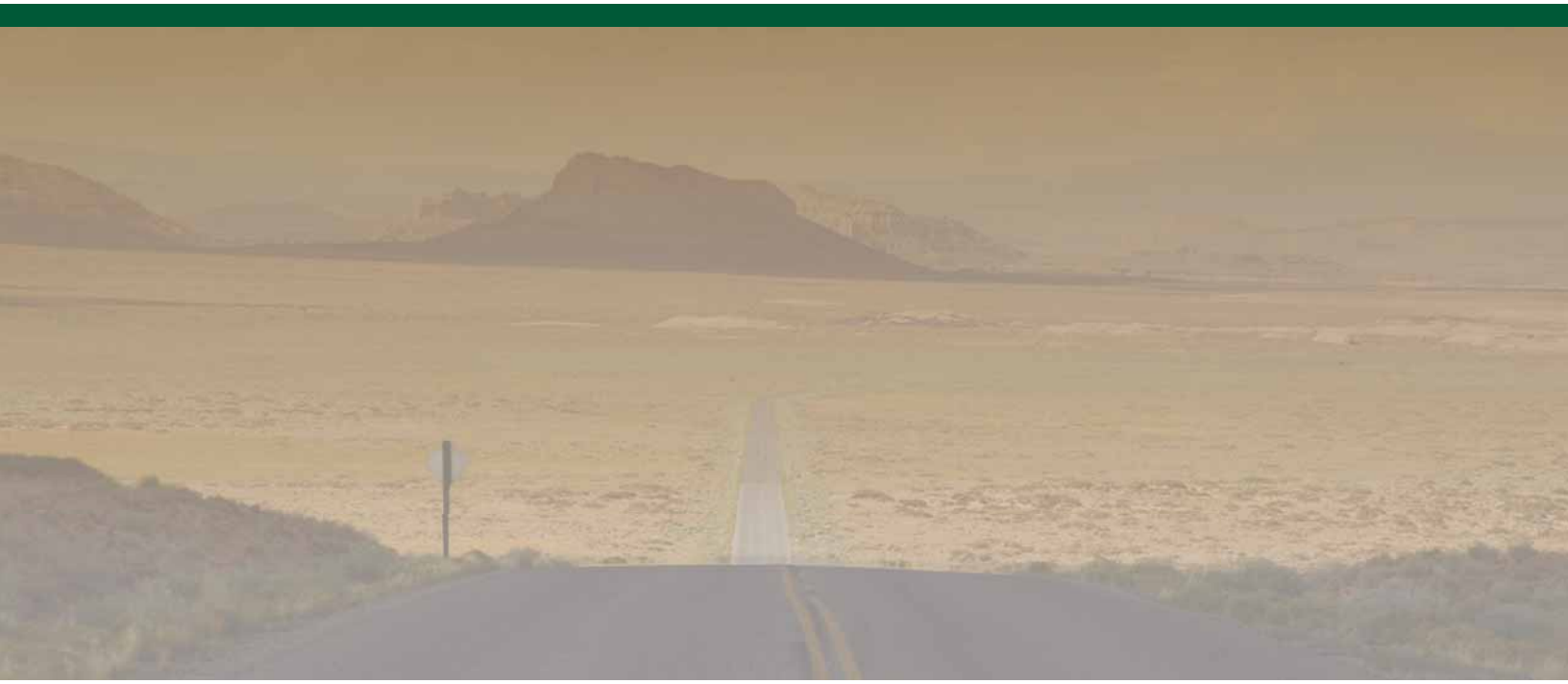
Road Safety Audit Toolkit for Federal Land Management Agencies and Tribal Governments





U.S. Department of Transportation
Federal Highway Administration

Safe Roads for a Safer Future
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RSA
Making Your Roads Safer

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16. Abstract.

Road Safety Audits/Assessments (RSAs) have proven to be an effective tool for improving safety on and along roadways. As such, the use of RSAs continues to grow throughout the United States. The success has led to the Federal Highway Administration (FHWA) including the RSA as one of its nine "proven safety countermeasures". Federal Land Management Agencies (FLMAs) and Tribes are beginning to witness the benefits of conducting RSAs. However, FLMAs and Tribes often face unique conditions, staffing, and funding constraints that do not allow resources to be devoted to improving roadway safety. The "Road Safety Audit Toolkit for Federal Land Management Agencies and Tribal Governments" is intended to be used by FLMAs and Tribes to overcome these obstacles. Information, ideas, and resources are provided in key topic areas including how to conduct an RSA, common safety issues and potential improvements, establishing an RSA program, and incorporating RSAs into the planning process. The Toolkit serves as a starting point, providing information to FLMAs and Tribes about partnerships needed to build support, available funding sources for the program and improvements, tools to conduct RSAs, and resources to identify safety issues and select countermeasures. Worksheets and other sample materials have been provided to aid in the RSA process including requesting assistance, scheduling, analyzing data, conducting field reviews, and documenting issues and suggestions. Examples of programs and experiences of other agencies have also been included throughout to provide examples of successes and struggles in implementing RSAs and improving safety for all road users.

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INTRODUCTION

Road Safety Audits/Assessments (RSAs) are a valuable tool used to evaluate road safety issues and to identify opportunities for improvement. The Federal Highway Administration (FHWA) defines an RSA as a "formal safety performance evaluation of an existing or future road or intersection by an independent, multidisciplinary team." RSAs can be used on any type of facility during any stage of the project development process.

RSAs EXAMINE ROADWAY AND ROADSIDE FEATURES THAT MAY POSE POTENTIAL SAFETY ISSUES.

Some element of safety is considered on every project. However, sometimes conditions on or adjacent to Federal and Tribal lands merit a more detailed safety review. For example, traffic volumes on a roadway may be higher than intended or may carry a higher percentage of trucks and other heavy vehicles due to unanticipated growth. These conditions can divide a Tribal community or interject a set of complexities to an unfamiliar visitor. RSAs examine these conditions in detail by pulling together a multidisciplinary team that looks at the issues from different perspectives – perspectives which are often not a part of a traditional safety review. RSAs also consider safety from a human factors point of view which aims to answer the following questions: How and why are people reacting to the roadway conditions? What do people sense and how do they react to those senses? What are the associated risks with those elements? The multidisciplinary team approach helps to answer these questions. Interactions between all road users (e.g., pedestrians and motor vehicles, commuter traffic and recreational vehicle traffic, bicycles and motor vehicles, etc.) are investigated to determine potential risk and to identify programs and measures to help reduce those risks and create safer environments for all road users.

Partner Agencies

- FHWA
- Tribal Governments
- Bureau of Indian Affairs
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife Service
- Bureau of Land Management
- Department of Defense
- Tennessee Valley Authority
- Bureau of Land Reclamation
- Tribal Technical Assistance Program

RSAs have proven to be an effective tool for improving safety on and along roadways. As such, the use of RSAs continues to grow throughout the U.S. A decade ago, few states had experience conducting RSAs; now each state has had some experience with the RSA process. The success has led to FHWA including the RSA process as one of its nine

"proven safety countermeasures." Federal Land Management Agencies (FLMAs) and Tribes are beginning to witness the benefits of conducting RSAs. FHWA Federal Lands Highway (FLH) division offices have helped plan or conduct RSAs on facilities owned by the National Park Service (NPS), Bureau of Land Management (BLM), U.S. Forest Service (FS), U.S. Fish and Wildlife Service (FWS), and several Tribes. The U.S. Fish and Wildlife Service has included RSA findings in planning and programming documents. Western Federal Lands Highway Division (WFLHD) has used RSAs in their project selection process. Tribes such as the Tohono O'odham Nation have worked with State and local agencies to conduct RSAs and implement RSA findings. However, while RSAs have secured a foothold with FLMAs and Tribes, more opportunities exist to promote RSAs as a tool to address safety on and adjacent to Federal and Tribal lands. Some examples include introducing FLMAs and Tribes to the RSA process, initiating full-fledged programs within agencies, and incorporating RSAs into the planning process, thus promoting a more comprehensive approach to addressing safety.

RSAs on Federal or Tribal facilities may encounter unique geometric and roadside conditions with significant historical, cultural, and environmental constraints.

Conducting an RSA does not require a large investment of time or money. RSAs require only a small percentage of the time and money needed for a typical roadway project. Furthermore, by gaining a better understanding of the safety implications of roadway and roadside features, RSAs can be used to prioritize locations with safety issues which help identify the best use for funding. Other benefits include encouraging multidisciplinary collaboration beyond the RSA, which promotes a better understanding of road user needs and safety.

Perhaps the best way to describe the effectiveness of RSAs is through a benefit/cost (B/C) ratio. A benefit/cost ratio is a measure to compare the benefits derived from the reduction of crashes to the cost of conducting an RSA and implementing crash reduction strategies. Benefit/cost ratios may be used as the ultimate measure of the project's success. The following case studies show the potential benefits of conducting RSAs.

RSAs will help save lives and reduce injuries. The success of RSAs has led to FHWA adopting the process as one of its nine "proven safety countermeasures." The success has been realized by many FLMAs and Tribes, which are planning and/or conducting a number of RSAs with various partners.

RSA Success Stories

Roadway

An RSA was conducted along a 3.84-mile section of a two-lane road in Cumberland County, Tennessee. Safety issues observed by the RSA team along the corridor included severe roadway curvature and limited sight distance. The team suggested the following measures: install curve warning and chevron signs, paint thicker (8") edgelines, and remove trees along the roadway.

- RSA Cost = $12,000
- Crash Reduction = 3.5%
- Implementation Cost = $23,000
- B/C Ratio = 20:1 (entire segment)

Intersection

An RSA was conducted at a signalized and an unsignalized intersection in Collier County, Florida. The potential safety issues included limited sight distance, faded and insufficient signing and markings, and lack of safe pedestrian facilities. Team suggestions included trimming vegetation, installing advance warning signs, constructing left-turn lanes, and providing pedestrian signal and sidewalk improvements.

- RSA Cost = $15,000
- Crash Reduction = 9.5%
- Implementation Cost = $250,000
- B/C Ratio = 8:1 (both intersections)

This Toolkit is intended to be used by Federal land agencies and Tribal governments as guidance and to provide information, ideas, and resources in key topic areas to lead the effort to improve safety through the use of the RSA:

- How do I conduct an RSA?
- What are common safety issues and potential countermeasures?
- How do I establish an RSA program?
- How do I incorporate RSAs in the planning process?
- What's next?

The Toolkit serves as a starting point, providing information to FLMAs and Tribes about identifying an RSA champion, partnerships needed to build support, available funding sources (for both the program and improvements), tools to conduct RSAs, and resources to identify safety issues and select countermeasures. Worksheets and other sample materials have been provided to aid in the RSA process, including requesting assistance, scheduling, analyzing data, conducting field reviews, and documenting issues and suggestions. Examples of programs and experiences of other agencies have also been included throughout to provide examples of successes and struggles in implementing RSAs and improving safety for all road users.

List of Terms

"4 E's"	Engineering, Education, Enforcement, and Emergency Medical Services
ADOT	Arizona Department of Transportation
B/C	Benefit/Cost
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CCP	Comprehensive Conservation Plan
CFLHD	Central Federal Lands Highway Division
COG	Council of Governments
DOI	United States Department of the Interior
DOT	Department of Transportation
EFLHD	Eastern Federal Lands Highway Division
EMS	Emergency Medical Services
FHWA	Federal Highway Administration
FLH	Federal Lands Highway
FLMA	Federal Land Management Agency
FS	United States Forest Service
FTA	Federal Transit Administration
FWS	United States Fish and Wildlife Service
GMP	General Management Plan
HSIP	Highway Safety Improvement Program
IHS	Indian Health Service
IRR	Indian Reservation Roads Program
ITCA	Inter Tribal Council of Arizona
LTAP	Local Technical Assistance Program
MPO	Metropolitan Planning Organization
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Protection Agency
NPS	National Park Service
NRDOT	Navajo Region Division of Transportation
PLHD	Public Land Highway Discretionary Program
RFP	Request for Proposal
RPC	Regional Planning Commission
RSA	Road Safety Audit/Assessment
SRTS	Safe Routes to School Program
STIP	Statewide Transportation Improvement Program
STP	Surface Transportation Program
TE	Transportation Enhancement
THSIP	Tribal Highway Safety Improvement Project
TIP	Transportation Improvement Program
TTAP	Tribal Technical Assistance Program
TTIP	Tribal Transportation Improvement Program
UDOT	Utah Department of Transportation
WFLHD	Western Federal Lands Highway Division
WisDOT	Wisconsin Department of Transportation

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CHAPTER 1: HOW DO I CONDUCT AN RSA?

This chapter provides critical information needed to conduct an RSA. Special considerations for FLMAs and Tribal transportation agencies in each step of the 8-step RSA process are described to help improve safety on and adjacent to Federal and Tribal lands.

WHAT IS AN RSA?

A Road Safety Audit/Assessment (RSA) is a formal safety performance examination of a future roadway project or an in-service facility that is conducted by an independent, experienced, multidisciplinary RSA team.

The primary focus of an RSA is safety while working within the context of the facility's existing mobility, access, surrounding land use, and/or aesthetics. RSAs enhance safety by considering potential safety issues presented to all road users under all conditions (e.g., day/night and dry/wet conditions). By focusing on safety, RSAs ensure that potentially hazardous roadway and roadside elements do not "fall through the cracks."

RSAs are commonly confused with other review processes, particularly traditional safety reviews. Traditional safety reviews are missing one or more of the key elements of an RSA. Table 1 compares the key elements of an RSA with the elements that are typically part of a traditional safety review or other safety study.

TABLE 1: WHAT ARE RSAS?

RSAs *are*:	RSAs *are not*:
✓ **Focused on road safety.**	× A means to evaluate the design of a facility.
✓ **A formal examination.**	× A check of compliance with standards.
✓ **Proactive in nature.**	× A means of ranking or justifying one project over another.
✓ **Conducted by a multidisciplinary team.**	× A means of rating one design option over another.
✓ **Conducted by a team that is independent of the operations, design, or ownership of the facility.**	× A redesign of a project.
✓ **Conducted by a qualified team.**	× A crash investigation (although the crash history of an existing facility is reviewed by an RSA team).
✓ **Broad enough to consider the safety of all road users of the facility.**	× A safety review.
✓ **Qualitative in nature.**	

WHAT SHOULD BE CONSIDERED FOR AN RSA?

The RSA process may be employed on any type of facility and during any stage of the project development process, including existing facilities that are open to traffic. RSAs conducted during the pre-construction phase can be particularly effective because there is an opportunity to address a number of safety issues. RSAs conducted in later stages have less ability to address these issues.

In addition to vehicular traffic safety issues, RSAs can also be oriented to specific user groups such as pedestrians and bicyclists. The RSA would still consider all potential users but may have a particular consideration for the needs of a specific group.

Common factors leading to requests for RSAs during the existing road stage include high crash frequencies, high profile crash types or political influence, and significant changes in traffic characteristics (current or expected). A potential factor leading to the request for an RSA in the planning or construction phase includes novel designs for the area, such as the introduction of a roundabout. Another factor may be a major change in the surrounding land use that accompanies the project.

The selected project should be scoped in size so that the RSA can be accomplished in a reasonable amount of time, usually two to three days or one week at most. For a corridor, this is generally a corridor of one to two miles in length or a longer corridor that is concentrated on issues at four or five spots within the corridor. For intersection projects, the scope should be limited to a series of four or five intersections.

HOW IS AN RSA CONDUCTED?

The *FHWA Road Safety Audit Guidelines* document (Publication FHWA-SA-06-06) describes the 8-step process for conducting RSAs. These steps are shown in Figure 1 illustrating the primary responsibilities of the project owner/design team and the RSA team. This section describes how these steps apply to an RSA conducted on or near Federal or Tribal lands.

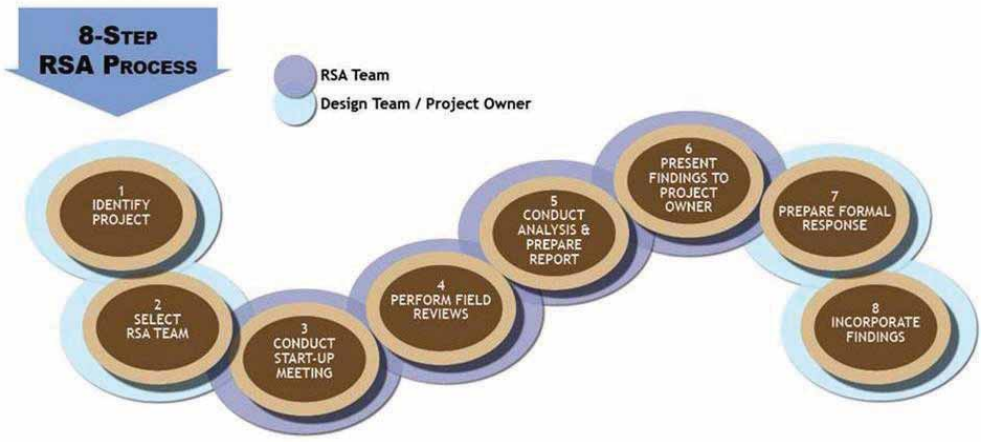

FIGURE 1: RSA PROCESS

Identify Project or Existing Road for RSA

Typically, the facility or project owner identifies the location(s) to be reviewed during the RSA. Jurisdictional authority of facilities involving Federal or Tribal lands can be unique. It is common that RSAs conducted at the request of FLMAs or Tribal transportation agencies are on facilities with different ownership, such as a State or local agency. In this case, a facility or project identified by a FLMA or tribe would need to contact the owning agency to request an RSA. For instance, a request may be initiated because of safety concerns about a road running adjacent to or through a Federal or Tribal land.

If, however, the FLMA or Tribal government is the owner, the approach can be decided internally within the agency. Depending on factors such as available staffing and funding, one of the following approaches may be taken:

- Issue a Request for Proposal (RFP) to obtain an experienced RSA team leader;
- Obtain technical assistance from FHWA, State or local Department of Transportation (DOT); or,
- Attend training to conduct your own RSAs.

Once the facility or project is identified, the RSA scope, schedule, team requirements, tasks to be completed, report format and content, and response procedures should be defined.

The appropriate season for the RSA review should also be established. For example, special events, or seasonal conditions are important to consider for the timing of the RSA.

Select Independent and Multidisciplinary RSA Team

Selecting a knowledgeable RSA team is vital to the success of an RSA. The facility or project owner is responsible for selecting the RSA team or the RSA team leader. Regardless of ownership the assistance of other local agencies may be sought due to their familiarity with the area. It is important that the RSA team is independent of the operations of the road or the design of the project being assessed to assure two things: that there is no bias in the assessment and the project is reviewed with "fresh eyes."

See the Resource Materials section for items to assist with identifying an approach to conduct an RSA:

- Example RFP
- Example application

The RSA team should include (but are not limited to) individuals with the following expertise:

- Road Safety
- Traffic Operations
- Road Design
- Transportation Planning
- Enforcement/Emergency Medical Service (EMS)
- Public Health
- Human Factors
- Maintenance
- Tribal Culture/Natural Preservation
- Community Organizations
- User Groups (pedestrians, bikers, ATV users)

Depending on different needs, the RSA team could include other specialists to ensure that all aspects of safety performance of the given facility can be adequately assessed.

The size of the RSA team may vary. The best practice is to have the smallest team that brings all the necessary knowledge and experience to the process for the specific location(s) being reviewed. As a general rule, the RSA team should be able to travel in one vehicle (except for police and EMS) so the team can review and discuss conditions in the field collectively.

Case Study

An RSA for the Navajo Nation in San Juan County, Utah included team members from the Navajo DOT, Navajo police, Utah DOT (UDOT), Bureau of Indian Affairs (BIA), Indian Health Services (IHS), FHWA, and the County. All members provided useful insights during the RSA process and several team members commented on the benefit of listening to and learning from their teammates who provided a different perspective on the safety issues and potential improvements. In particular, the public health representative contributed valuable information regarding road-user demographics as well as opportunities for educational improvements, such as road safety campaigns.

Conduct Start-up Meeting to Exchange Information

The purpose of the start-up meeting is to ensure the project owner/design team and all RSA team members understand the purpose, schedule, and roles and responsibilities of all participants in the RSA. This meeting helps establish lines of communication between the RSA team leader and the project owner/design team. At the end of the meeting, all parties should have a clear understanding of the scope of the RSA to be undertaken and each of their roles and responsibilities. Specific topics of discussion may include:

- Review the scope and objectives of the RSA.
- Review all relevant data, information, drawings, aerials, photos, etc.
- Discuss design constraints, standards used, findings of previous RSAs/safety studies, local traffic laws, statutes, and customary usage affecting road users.
- Communicate any other matters of importance to the RSA team.

See the Resource Materials section for items to assist with the start-up meeting:

- Example agenda
- Typical data requested
- Example collision diagram & worksheet

If possible, the owner and/or design team should provide data describing the existing and planned conditions (if applicable) as well as the existing safety performance (e.g., crash records/data, traffic volumes, etc.). Ideally data will be provided prior to the start-up meeting for review/analysis by the RSA team. This will enable the team to ask detailed questions at the start-up meeting. Naturally the desired data may not be readily available; however, any information that can be provided to the RSA team is beneficial to the understanding of the location(s) to be reviewed and the potential safety issues.

Perform Field Reviews under Various Conditions

The RSA team should review the entire site (as well as plans if conducting an RSA of a design), documenting potential safety issues and project constraints (e.g. available right-of-way, impact on adjacent land). Issues identified in the review of project data (e.g., safety

See the Resource Materials section for items to assist with the field review:

- Example field notes sheet
- List of materials needed for field review

concerns related to crash clusters) should be verified in the field. Key elements to observe include:

- Site characteristics (road geometry, sight distances, clear zones, drainage, surface condition, signing, lighting, and barriers).
- Traffic characteristics (traffic volume, movements, typical speeds, and traffic mix).
- Surrounding land uses (including traffic, pedestrian, and bicycle generators).
- Human factors issues (such as road user "expectancy," reactions, and other behaviors).

The FHWA *Road Safety Audit Guidelines* and *Pedestrian Road Safety Audit Guidelines and Prompt Lists* provide prompts to help the RSA team identify potential safety issues and ensure that roadway elements are not overlooked.

A thorough site visit will include field reviews under various conditions. At a minimum, the RSA team should review the site during the following conditions:

- *Day and night* to experience conditions from the perspective of all roadway users during different lighting scenarios.
- *Peak and non-peak* to experience the influence of traffic conditions on safety, mobility, and access.

Conduct RSA Analysis and Prepare Report Findings

The RSA team conducts an analysis to identify safety issues based on data from the field visit and preliminary documents. The safety issues may be prioritized by the RSA team based on the perceived risk. For each identified safety issue, the RSA team generates a list of possible measures to mitigate the crash potential and/or severity of a potential crash. Chapter 2 provides more detailed information on this step of the process.

The RSA team then prepares a summary of the safety issues and related suggestions for improvement. Prior to preparing a report, the team may meet with the owner and/or design team to discuss preliminary findings (Step 6).

The RSA report should include a brief description of the project, a listing of the RSA team members and their qualifications, a listing of the data and information used in conducting the RSA, and a summary of findings and proposed safety measures. It should include pictures and diagrams that may be useful to further illustrate issues and countermeasures.

See the Resource Materials section for additional guidance on report content and format:

- Example report outline
- Example presentation of issues & suggestions

Present RSA Findings to Owner/Design Team

The results of the RSA are presented to the owner/design team. The purpose of this meeting is to establish a basis for writing the RSA report and to ensure that the report will adequately address issues that are within the scope of the RSA process. This is another opportunity for discussion and clarification. The project owner/design team may ask questions to seek clarification on the RSA findings or suggest additional/alternative mitigation measures.

Prepare Formal Response

Once the owner and/or design team have reviewed the RSA report, they should prepare a written response to its findings. The response should outline what actions the owner and/or design team will take with respect to each safety concern listed in the RSA report. A letter, signed by the project owner, is a valid method of responding to the RSA report. The RSA findings may be presented in a public meeting or the report could be made available to the public to help garner support for the findings and the overall RSA process. This can be particularly beneficial on projects with a high degree of public involvement, such as pedestrian facilities.

Incorporate Findings into the Project when Appropriate

After the response to the RSA report is prepared, the project owner and/or design team should work to implement the agreed-upon safety measures or create an implementation plan. RSA findings can be incorporated into an agency's planning process, as discussed in Chapter 4. An important consideration is to evaluate the RSA program and share lessons learned. An RSA "after action review" can be scheduled for the RSA team to evaluate the effectiveness of the suggested measures implemented and to evaluate if other measures are needed.

WHAT ARE THE TIME REQUIREMENTS AND COSTS ASSOCIATED WITH AN RSA?

The time and cost to complete an RSA vary based upon conditions such as project extents, level of detail, logistics, and team size. Figure 2 presents a generalized timeline of the RSA process. Please note that the writing of the report does not necessarily have to occur in Step 5; it can be completed following the presentation of preliminary findings in Step 6.

<table>
<tr><th>Step</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5*</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td rowspan="2">Description</td><td rowspan="2">Identify Project</td><td rowspan="2">Select RSA Team</td><td>Conduct Start-Up Meeting</td><td>Perform Field Reviews</td><td>Conduct Analysis & Prepare Report</td><td>Present Findings to Project Owner</td><td>Prepare Formal Response</td><td>Incorporate Findings</td></tr>
<tr><td colspan="4">Conduct RSA Workshop: Write RSA Report</td><td>Develop Plan to Address RSA Findings</td><td>Implement Suggestions</td></tr>
<tr><td>Duration</td><td>Depends upon project selection process; est. 1 day - 1 year+</td><td>Depends upon team composition & availability; est. 1 day - 1 month</td><td colspan="4">RSA Workshop: Typically 1/2 - 3 days
RSA Report: Typically 1/2 day - 3 weeks</td><td>Several days - 1 month</td><td>short-term: up to 1 year
intermediate: 1-5 years
long-term: 5+ years</td></tr>
</table>

*Report may occur following Step 6

FIGURE 2: RSA TIME REQUIREMENTS BY STEP

In total, the entire RSA process (Steps 1 through 8) could range from a month to a couple years. The cost to conduct an RSA depends largely upon the approach (discussed in Step 1) and the level of effort required by the RSA team.

WHO SHOULD I PARTNER WITH TO SET-UP AN RSA?

Several Federal, Tribal, State, and local agencies have used RSAs as a tool for improving safety. Initially, it is important to identify a local champion, either internally or externally, to support the RSA and its outcome (see Chapter 3 for more details). If the RSA is on or adjacent to Federal or Tribal lands, the local champion should be able to communicate effectively with all parties involved. It is particularly important to communicate the need for and desired outcome of an RSA. The next challenge is to assemble an independent RSA team. Since independence is a requirement of an RSA, the agencies may contact the State and/or local DOT, Local and/or Tribal Technical Assistance Program (LTAP/TTAP) center, FHWA Division Office, FHWA's RSA Peer-to-Peer Program, FHWA's Federal Lands Division Office, or FHWA's Offices of Safety and Federal Lands Highway for assistance in finding team members. Federal and Tribal transportation agencies may also find it helpful to contact staff from other nearby Federal agencies or Tribes with whom they may establish a reciprocal relationship.

RSAS CONDUCTED ON OR NEAR FEDERAL OR TRIBAL LANDS MAY NECESSITATE INVOLVEMENT FROM MULTIPLE AGENCIES.

CHAPTER 2: WHAT ARE COMMON SAFETY ISSUES AND POTENTIAL COUNTERMEASURES?

This chapter describes potential safety issues identified on Federal and Tribal lands as well as a list of potential low-cost countermeasures for addressing these issues. A basic prioritization methodology is also discussed.

WHAT TYPES OF SAFETY ISSUES MIGHT I ENCOUNTER?

Most issues on or adjacent to Federal and Tribal lands have both an engineering and behavioral element. For example, traffic types and volumes may be inconsistent with the intended roadway design due to changes in the functionality of the roadway and land use in surrounding areas. This may result in a roadway serving mostly commuter traffic, an increase in heavy vehicular traffic, or seasonal traffic peaks and variations. As such, shoulder widths and roadsides may not adequately address the increased risk to drivers. From a behavioral standpoint, lack of awareness of the intended purpose of the roadway may result in motorists not applying the appropriate driving techniques for the conditions. Furthermore, driver expectancy of other road users such as pedestrians and bicyclists may not reflect the intended usage.

The RSA team should determine the safety issues while considering the infrastructure and the behavior elements. Table 2 illustrates common safety issues and behavioral aspects relating to these issues on or near Federal and Tribal lands listed by roadway element. The RSA team is charged with determining specific roadway and behavioral issues for the specific project they are assessing. The documents in the Resource Materials section provide further detail with regard to the issues presented here and to other potential safety hazards that an RSA team should be aware of when conducting a field review.

WHAT ARE COMMON COUNTERMEASURES?

Table 2 also presents common countermeasures that may be used to address road safety issues on or near Federal and Tribal lands. This list is not comprehensive; it is intended to provide general guidance to typical countermeasures. Note that the countermeasures identified in this list are primarily low-cost engineering measures, although a few relatively high-cost options are included because they are considered to be "proven" countermeasures. A few specific education and enforcement measures are identified as well, but a more general discussion of how to incorporate education, enforcement, and EMS countermeasures is provided in the following section. The documents in the Resource Materials section provide a much wider and detailed range of potential countermeasures and their effectiveness and should be used as guidance when considering safety measures during the RSA process.

Table 2: Common Safety Issues and Countermeasures

Topic Area	General Issues	Example Observations	Example Countermeasures
Cross-section	Limited pavement width	Narrow or no paved shoulders	Improve/stabilize unpaved shoulders Install safety edge Install new paved shoulders or widen existing paved shoulders Install centerline or edgeline rumble strips or rumble stripes
	Pavement edge drops	Vertical pavement edge drops greater than two inches	
Horizontal curves	Sharp curves	Limited sight distance	Install advance curve warning (with/without advisory speed) Install centerline and edgeline pavement markings Improve delineation (e.g., chevrons, post-mounted delineators) Upgrade existing signs (size, retroreflectivity, location) Improve skid resistance with high-friction treatment (e.g., NovaChip, microsurfacing, etc.)
		Inadequate superelevation	
	Various levels of delineation	Inconsistent and old signing	
		Faded pavement markings; no edgelines	
Roadside hazards	Common roadside hazards located in close proximity to the roadway	Trees, rocks, utility poles, guide wires	The order of preference for treating roadside hazards (from most preferred to least preferred)[1] is to: 1. Remove the obstacle. 2. Redesign the obstacle so it can be safely traversed. 3. Relocate the obstacle to a point where it is less likely to be struck. 4. Reduce impact severity by using an appropriate breakaway device. 5. Shield the obstacle with a longitudinal traffic barrier designed for redirection or use a crash cushion. 6. Delineate the obstacle if the above alternatives are not appropriate.
		Steep embankments	
		Drainage features (inlets, headwalls, culverts)	
		Large bodies of water Walls and barriers	

1 American Association of State Highway and Transportation Officials (AASHTO). Roadside Design Guide. 2002 3rd Edition with 2006 Chapter 6 Update.

Topic Area	General Issues	Example Observations	Example Countermeasures
Intersections	Lack of driver expectancy	Sight distance to the intersection Inconsistent and old signing	Enhance driver expectation of intersections (e.g., advance pavement markings and/or signs, lateral rumble strips) Provide adequate sight distance to intersection Enhance conspicuity of signs and pavement markings (size, retroreflectivity, location, number) Improve line of sight at the intersection/provide clear sight triangles Reduce conflict points by installing turn lanes and consolidating driveways (access management) Provide lighting Consider roundabouts
	Obstructions in the sight triangle	Sight distance at the intersection	
	Driver behavior	Poor gap acceptance at stop-controlled intersections	
Lighting	Roadway and intersection lighting	Inadequate or lack of lighting Limited visibility of pedestrian/bicycle traffic; also, animals/wildlife	Install/improve lighting along roadway or at intersections
Pedestrians and bicyclists	Lack of designated facilities for pedestrians and bicyclists	No sidewalks or shared use paths and limited shoulders Lack of designated crossings	Provide designated pedestrian and bicycle facilities Install or widen paved shoulder to a minimum of four feet for use by pedestrians and bicyclists Construct a shared use path Enhance driver awareness of pedestrians, bicyclists, and crossings (e.g., warning signs, pavement markings, standard and/or hybrid signals) Provide median refuge areas Provide educational information to road users with regard to safe use Enforce pedestrian and bicycle laws
	Driver behavior	Lack of driver awareness of pedestrians and bicyclists	
	Pedestrian and bicyclist behavior	Lack of familiarity with road network and safety issues (tourists)	

Topic Area	General Issues	Example Observations	Example Countermeasures
Animals	Open range livestock	Roadside grazing	Enhance driver awareness of animals and animal crossings (e.g., signs) Install animal/wildlife fencing to reduce the number of potential conflict points Construct wildlife crossings (i.e., overpasses and underpasses) along primary migratory/feeding routes Enact and enforce laws to prohibit grazing within the right-of-way Educate owners about animal control laws and liability
	Wildlife	Annual migration routes	
Speed management	High vehicle speeds	Limited enforcement due to large jurisdictions	Coordinate with local enforcement to conduct targeted speed enforcement Consider alternative measures (e.g., speed trailers) Install gateway treatments at the entrances to towns
Vehicle mix	All Terrain Vehicles (ATVs)/ Snowmobiles	ATVs or snowmobiles on and along the roadway ATVs or snowmobiles crossing the roadway	Provide educational information to road users with regard to safe operating/use Install warning signs and markings to indicate ATV/snowmobile crossings Inform ATV/snowmobile riders of appropriate/designated trails Coordinate with local enforcement Support educational campaigns by enforcing ATV/snowmobile operations Provide sidewalks or shared-use paths to separate non-motorized road users
	Trucks and buses	Trucks and buses interacting with other road users, especially non-motorized	

Topic Area	General Issues	Example Observations	Example Countermeasures
Access to facilities and communities	Location	Limited sight distance/ awareness of facilities Access along high-speed roads Inadequate pedestrian / bicycle accommodations	Enhance driver awareness of facilities/communities (e.g., advance warning signs and/or guide signs, gateway treatments) Clear sight triangles at entrances/exits Separate turning vehicles by installing left- and/or right-turn lanes Install shared use path or provide an adequate shoulder to separate pedestrians and bicyclists from motor vehicle traffic Conduct a parking study Identify current occupancy and determine needed capacity Identify opportunities to provide better connectivity between parking facilities and pedestrian/bicycle generators
	Parking	Limited capacity (spillover) Lack of connectivity to destinations	

HOW CAN I INCORPORATE EDUCATION, ENFORCEMENT, AND EMS COUNTERMEASURES?

Safety issues cannot be completely addressed through engineering alone. The other "E's" include education, enforcement, and emergency medical services (EMS). The RSA team should encourage and suggest measures that consider all "4 E's" to address specific safety issues. Communication and coordination among the "E's" is essential to ensuring safety is addressed at a comprehensive level. The agencies conducting RSAs may need to regularly assemble representatives from each of the "4 E's" to ensure that countermeasures and strategies are complementing one another. Some examples of education, enforcement, and EMS countermeasures are presented below; *NCHRP Report 622* provides a more complete description of countermeasures that may aid education, enforcement, and EMS safety strategies (see Resource Materials section for complete reference). Although the report is based on countermeasures targeting a State Highway Safety Office audience, the information provided may be applicable to safety issues observed by Federal and Tribal agencies.

Education – All road users must be aware of the safe and proper way to use roads. Due to the unique characteristics of Federal and Tribal land roadways, users need to be made aware of safe travel practices and potential hazards. Example methods of transferring this information include postings on the internet, brochures provided at visitor's centers, and video messages. Additional information on effective education strategies may be acquired through outreach groups such as Tribal Technical Assistance Programs (TTAPs).

Enforcement – Laws are intended to control the operation of road users. Enforcing speed limit and compliance with signal/sign indications, as well as correcting wrong-way riding and impaired driving create a safer travel environment for all road users. Staffing and funding constraints may limit the ability of a Federal or Tribal land agency to provide comprehensive enforcement; however, efforts should be made to target specific issues or frequent or high-risk behaviors. This can be done by identifying prevalent factors that contribute to crashes along the roadway of interest and targeting behaviors that relate to those issues. For example, if alcohol was determined to be a primary contributing factor in 50 percent of fatal and injury crashes along a specific route, it may be appropriate to deploy a checkpoint to combat drinking and driving; this could be further targeted by identifying the time of day and day of week when this behavior is most likely to occur.

LAW ENFORCEMENT ON RSAS IS HELPFUL TO IDENTIFY SAFETY ISSUES AS WELL AS TO SUGGEST TARGETED ENFORCEMENT COUNTERMEASURES.

Emergency Medical Services – The rural nature of many roadways on or near Federal or Tribal lands may play a major role in limiting the ability to provide timely medical treatment to people injured in a crash. Factors contributing to response time include the ability of other motorists to identify a crash and to notify emergency personnel, the ability of emergency personnel to quickly respond to the scene, and the ability to quickly transport the victim(s) to a trauma center. Adequate cell phone service coverage and routine patrols are a few methods that can help save a life in the event of a serious injury.

HOW DO I PRIORITIZE ISSUES?

A prioritization process is useful for identifying the most pressing safety needs based on the findings of the RSA team. Table 3 is a matrix that can be used in the prioritization process. In general, issues associated with more frequent crashes and higher severity levels tend to be given higher priority. The prioritization can be based on historical crash data, expert judgment (provided by the RSA team), or a combination of the two.

Table 3: Issue Prioritization Matrix

Frequency of Crashes	Severity of Crashes			
	Possible/Minor Injury	*Moderate Injury*	*Serious Injury*	*Fatal*
Frequent	Middle-High	High	Highest	Highest
Occasional	Middle	Middle-High	High	Highest
Infrequent	Low	Moderate	Middle-High	High
Rare	Lowest	Low	Middle	Middle-High

For many RSAs conducted in rural areas, reliable crash data are not available. Anecdotal information (e.g., from maintenance, enforcement call logs, land owners) and evidence of conflicts and crashes (e.g., skid marks and fence strikes) help to create a more complete picture of potential hazards, but cannot be quantified with any certainty. In these cases, the likely *frequency* and *severity* of crashes associated with each safety issue are qualitatively estimated, based on the experience and expectations of RSA team members. Expected crash *frequency* can be qualitatively estimated on the basis of exposure (how many road users would likely be exposed to the identified safety issue?) and probability (how likely was it that a collision would result from the identified issue?). Expected crash *severity* can be qualitatively estimated on the basis of factors such as anticipated speeds, expected collision types, and the likelihood that vulnerable road users would be exposed. These two risk elements (frequency and severity) are then combined to obtain a qualitative risk assessment.

CHAPTER 3: HOW DO I ESTABLISH AN RSA PROGRAM?

This section describes the process to initiate an RSA program, including potential program structures, partners, and funding sources. Discussion on how to prioritize locations to conduct RSAs is also included. It presents potential challenges and provides suggestions for overcoming these challenges. Finally, it suggests performance measures that may be used to evaluate the progress and success of the program.

HOW ARE RSA PROGRAMS STRUCTURED?

The successful integration of RSAs into any agency requires several important elements: management commitment, an agreed-upon policy/process, informed project managers, an ongoing training program, and skilled RSA team members. Program structures vary by agency depending on the goals and objectives as well as available resources and level of training. The *FHWA Road Safety Audit Guidelines* recommends an approach for introducing RSAs that typically includes:

1. Piloting RSA projects – conduct one or more projects with in-house personnel that are guided by individuals experienced in the process.
2. Developing a formal RSA policy/process – use the experience from the pilot projects to develop an RSA policy/process suited to the local conditions; establish criteria for site selection, procedures for conducting and documenting field reviews, and opportunities for additional training.
3. Monitoring, refinement, and promotion of the RSA policy/process – periodically review the current policy/process to ensure the desired level of success is being achieved and modify as necessary to increase efficiency and effectiveness.

HOW DO I PRIORITIZE POTENTIAL RSA LOCATIONS?

There are numerous methods for prioritizing RSA locations. The method of choice will depend on the availability of staff and data resources, as well as the number of requests for RSAs. If RSA efforts are request-based, it is not necessary to waste valuable resources on a complex prioritization process when the number of requests is relatively low; it may suffice to simply prioritize locations on a first-come-first-served basis. As the number of requests increases, it will become necessary to prioritize and perhaps even screen locations, which requires a formal (and likely data-driven) process. This does not mean that the process has to be completely quantitative and objective. However, good transportation safety planning should focus RSA efforts on areas with the highest concentration of crashes, particularly deaths and injuries. Other factors to be considered can include timeframe, cost, relation to overall program goals, and stakeholder support. Chapter 2 of the *FHWA Road Safety Audit Guidelines*

suggests an application of nominal (compliance to design standards) and substantive (crash performance) safety concepts to prioritize locations; please refer to that publication for more information.

WHO SHOULD I PARTNER WITH TO ESTABLISH AN RSA PROGRAM?

An RSA program may be established by and housed at any one of a number of agencies. Regardless of where the program is housed, it is critical to identify a champion to lead and promote the RSA program (or at least the establishment of the RSA program) at the highest level of the organization. Depending on factors such as available staff, experience, and funding, FLMAs or Tribes may decide to identify a champion internally within their own agency or seek an external champion. A champion may be an individual or may be an entire agency or department of an agency. In any event, the champion should be knowledgeable of the RSA process and potential benefits so that RSAs can be introduced to others to promote awareness and foster support.

While the champion is responsible for introducing and promoting RSAs, there is a need to identify a support network to provide staff, funding, expertise, and public and political support. Table 4 identifies potential partners that could help establish, house, staff, fund, or support an RSA program.

Table 4: RSA Program Participation

Potential Partners for RSA Program	House	Staff	Fund	Support
Tribal/State/Local DOT	X	X	X	X
Forest Service		X	X	X
National Park Service		X	X	X
Fish and Wildlife Service		X	X	X
Tribal Technical Assistance Program	X	X	X	X
FHWA (including Federal Lands and Federal Aid Division offices)		X	X	X
BIA Division of Transportation		X	X	X
Public health agencies/officials		X	X	X
Public officials			X	X
Other groups (e.g., community safety teams)		X		X
Tribal Cultural Officials		X		X

WHAT FUNDING MECHANISMS ARE IN PLACE?

An important consideration when establishing an RSA program is funding, not only for the functionality of the program but also for the implementation of proposed safety improvements. A number of funding resources are provided in this section for initial guidance. In addition to these resources, it is recommended that Federal and Tribal agencies consult their local FHWA division, State DOT, and local Metropolitan Planning Organization/Council of Governments/Regional Planning Commission (MPO/COG/RPC) offices to learn more about available funding mechanisms. Up-to-date information on funding opportunities can also be obtained by visiting the following websites:

- Tribal Highway Safety Improvement Implementation Guide
  http://www.fhwa.dot.gov/hep/tribaltrans/saf_guide.htm
- Tribal Transportation Funding Resources
  http://www.fhwa.dot.gov/hep/tribaltrans/ttfundresource.pdf
- FHWA Discretionary Programs website
  http://www.fhwa.dot.gov/discretionary/proginfo.cfm

The Federal government provides funding assistance for eligible activities through legislative formulas and discretionary authority, including some 100 percent Federal-aid programs and programs based on 90/10 or 80/20 Federal/local matches. The *Tribal Highway Safety Improvement Implementation Guide* advises that the implementation plan for a Tribal Highway Safety Improvement Project (THSIP) or highway safety project will depend greatly on which funding sources the Tribes pursue, since each source has different program eligibility requirements. Some of the important safety-funding sources are presented in Table 5.

Table 5: Potential Funding Sources

Source	Website	Purpose / Use
Highway Safety Improvement Program (HSIP)	http://safety.fhwa.dot.gov/hsip	Projects that improve safety.
Surface Transportation Program (STP)	http://www.fhwa.dot.gov/safetealu/factsheets/stp.htm	Projects on Federal-aid highways, including the NHS, bridge projects on any public road, transit capital projects, and intracity/intercity bus facilities. Now limited to urban areas.
Transportation Enhancement (TE)	http://www.enhancements.org	Projects involving pedestrian facilities and scenic highways.
Safe Routes to School (SRTS) Program	http://safety.fhwa.dot.gov/saferoutes	Enable and encourage children to walk and bike to school.
National Scenic Byway Program	http://www.byways.org/learn/program.html	Nationally or locally designated roads with outstanding scenic, historic, cultural, natural, recreational, and archaeological qualities.
Indian Reservation Roads (IRR) Program	http://flh.fhwa.dot.gov/programs/irr	Planning, design, construction, and maintenance activities addressing Tribal transportation needs.
Park Roads and Parkways Program	http://flh.fhwa.dot.gov/programs/prp	Design, construction, reconstruction, maintenance, or improvement of roads and bridges providing access to or within a unit of the National Park Service.
Refuge Roads Program	http://flh.fhwa.dot.gov/programs/rr	Design, construction, reconstruction, maintenance, or improvement of roads and bridges providing access to or within a unit of the National Wildlife Refuge System.
Forest Highway Program	http://flh.fhwa.dot.gov/programs/plh/fh	Resurface, restore, rehabilitate, or reconstruct roads providing access to or within a unit of the National Forest or Grassland.
Public Lands Highway Discretionary (PLHD) Program	http://flh.fhwa.dot.gov/programs/plh/discretionary	Planning, research, engineering, and construction of highways, roads, parkways, and transit facilities within, adjacent to, or providing access to reservations and Federal public lands.
Indian Health Service Injury Prevention Program	http://www.ihs.gov/MedicalPrograms/InjuryPrevention/index.cfm	Basic and advanced injury prevention projects.

WHAT CHALLENGES WILL I FACE?

Wilson and Lipinski[2] noted in their synthesis of RSA practices in the United States that the introduction of RSAs or an RSA program can face opposition based on liability concerns, the anticipated costs of the RSA or of implementing suggested changes, and commitment of staff resources. Other challenges include cultural and institutional barriers (e.g., lack of support from within), lack of RSA training, and lack of long-term support.

HOW DO I OVERCOME THESE CHALLENGES?

The following were identified as potential challenges to establishing an RSA program; methods to overcome each potential challenge are also presented. Note that education and awareness are a common theme.

- **Risk Management:** There is sometimes a concern that agencies conducting RSAs will be held responsible in the event of a crash after a review has been completed. RSAs are just one of several proactive risk management techniques that demonstrate an agency's responsiveness to the safety needs of the public. Following the 8-step RSA process and using the information garnered from the RSA should be included in the framework of the agency's safety management system. It is important that agencies thoroughly document the RSA and resulting actions.
- **Funding:** A common issue with establishing and sustaining any program or activity is funding. In many areas, funding is available from various sources to conduct RSAs. Guidance with regard to funding sources has been provided in this chapter.
- **Staffing:** Limited staff is a common issue for many agencies. While in-house staff may not be available, there are other options to create an RSA team (see Chapter 1). An additional resource is the FHWA Peer-to-Peer program which will assist in identifying the appropriate personnel from a nearby State or local agency.
- **Skills:** It may be difficult to sustain an in-house RSA program without proper training. While outside options are available for an RSA lead or technical support, it may be more cost effective to complete the appropriate training and lead RSAs with in-house staff. Even if an outside source is used, it still may prove beneficial to support the RSA team with trained in-house staff that is knowledgeable of the RSA process and specific safety issues. Check with FHWA and State and local agencies for training opportunities.
- **Cultural and Institutional History:** Many Federal and Tribal lands are steeped in tradition. As such, it may be difficult to introduce new programs or processes. A local champion can help to overcome this challenge by explaining the purpose and benefits of the RSA process. Agencies that have proactively involved their cultural heritage representatives within the RSA process have been successful in making roadway improvements. Conducting an RSA provides an opportunity for senior leaders to realize the benefits of RSAs and help promote their wider acceptance.

2 Eugene Wilson and Martin Lipinski. NCHRP Synthesis 336: Road Safety Audits, A Synthesis of Highway Practice (National Cooperative Highway Research Program, TRB, 2004)

- **Long-Term Support:** It is relatively easy to schedule a single RSA; however, it is more difficult to sustain an RSA program due to funding and staffing commitments. In addition to the funding and staffing support discussed in this chapter, another option for long-term support is to involve the public or specific community groups. The RSA process provides a way for the public to voice their concerns and take action.

HOW DO I ESTABLISH GOALS AND PERFORMANCE MEASURES FOR AN RSA PROGRAM?

As support is gained to establish an RSA program, it will be useful to begin to define goals and performance measures. Goals help to guide the direction of the program while performance measures help to identify the success of the program. Performance measures are also important because they can be used (or may be required) to obtain or renew funding. Example goals and performance measures are presented in Table 6.

- **Goals:** Goals are generally established by a group of representatives from the agency or agencies responsible for administering the program. Goals will vary by program; however, they should be specific, measurable, attainable, relevant, and timely. Goals should be reevaluated over time or as they are met. Early in an RSA program, the goals may be related to the sustainability of the program. As the program becomes more established, goals may be related to gains in safety.
- **Performance Measures:** Performance measures can be established to indicate the relative success of the program. They will depend on the specific goals of the program and should be established to directly measure the progress in attaining a specific goal.

Table 6: Example Goals and Performance Measures

Goal	Performance Measure
Provide RSA training to X percent of agency personnel with Y years.	Percentage of personnel trained to conduct RSAs.
Conduct X RSAs per year at high-crash/risk and/or high-profile locations.	Number of RSAs conducted per year.
Reduce injuries and fatalities by X percent per year with low-cost, quickly implemented improvements.	Number of total crashes or specific crash types/severities at locations where RSAs are conducted.

CHAPTER 4: HOW DO I INCORPORATE RSAs IN THE PLANNING PROCESS?

This section describes the process for integrating RSAs in the planning process, including potential partners, implementing RSA findings, and potential challenges.

WHO SHOULD I PARTNER WITH TO INTEGRATE AN RSA PROGRAM IN THE PLANNING PROCESS?

Many of the same partners identified to assemble an RSA team are the same partners that can assist in integrating an RSA program into the planning process. For example, the Office of Federal Lands Highway provides "program stewardship and transportation engineering services for planning, design, construction, and rehabilitation of the highways and bridges that provide access to and through Federally-owned lands." FLH consists of the following: Eastern (http://www.efl.fhwa.dot.gov/), Central (http://www.cflhd.gov/), and Western (http://www.wfl.fhwa.dot.gov/) Federal Lands Highway Divisions as well as the Headquarters (http://flh.fhwa.dot.gov/) office. These units of the FLH work with Tribes, FLMAs, and States to address and improve safety. FHWA's Division Office in each state is also a resourceful partnering agency.

State DOTs, MPOs, and COGs are also open to forming partnerships with Federal and Tribal land agencies. Several DOTs have internal departments devoted specifically to setting up partnerships between agencies. Federal and Tribal land agencies also have formed committees and councils to communicate their needs to DOTs, MPOs, and COGs. By working together, agencies have realized the benefits of cooperative participation where the needs and concerns of all parties involved can be voiced and addressed in a timely and efficient manner.

RSAs on Federal and Tribal Lands often require unique partnerships to assess safety. These partnerships can be critical in incorporating long-term suggestions or establishing a long-term RSA program.

CASE STUDY

In Arizona, coordination and information sharing between the Arizona Department of Transportation (ADOT) and the Inter Tribal Council of Arizona, Inc. (ITCA) have advanced consultation activities between ADOT and tribal governments in transportation planning efforts. The partnering between ADOT and the ITCA has (1) provided insight to ADOT staff of the challenges facing tribes throughout the state, and (2) increased awareness amongst tribal transportation staff of the opportunities for input into state-level transportation planning efforts. Besides the ITCA, ADOT has formed partnerships with other agencies: Arizona State Land Department, Arizona Tribal Strategic Partnering Team, Bureau of Land Management, the United States Forest Service, and FHWA. These partnerships have helped effectively streamline tribal transportation consultation in Arizona. In an effort to assist tribal governments and tribal planning departments in understanding the ADOT transportation planning and programming processes, ADOT has developed *Transportation Planning and Programming – Guidebook for Tribal Governments.*

The Arizona Tribal Transportation website (http://www.aztribaltransportation.org/) provides a wealth of information with regard to state-tribal transportation related partnerships, projects, activities, and funding resources. Other helpful information can be found on ADOT's partnering office website (http://www.azdot.gov/CCPartnerships/Partnering/Index.asp) and on the ITCA website (http://www.itcaonline.com/).

CASE STUDY

The Wisconsin Department of Transportation (WisDOT) has formed a formal partnership with the State's Federally-recognized Tribes. The Wisconsin State Tribal Relations Initiative recognizes the government-to-government relationship between the State and Tribal governments. As such, the State-Tribal Consultation Initiative is poised at improving communication between State and Tribal representatives to ensure that concerns and issues are addressed in a timely and efficient manner. This partnership is applied through the WisDOT Tribal Task Force. Since 2008, the task force has provided funding for the Tribes to conduct RSAs. Many of the RSAs were targeted at Reservations where WisDOT was planning roadway improvements.

HOW DO I INCORPORATE RSA FINDINGS IN THE PLANNING PROCESS?

Step 8 of the RSA process introduced in Chapter 1 involves the implementation of safety improvement measures identified by the RSA team. Incorporating RSA findings into the planning process is largely dependent on the desired timeframe for implementation (i.e., short-, intermediate-, or long-term). Short-term improvements (e.g., signing, pavement markings, and vegetation control) can often be handled through maintenance activities. Intermediate- and long-term improvements (e.g., updating/installing guardrail, installing a shared use path, realigning/widening, etc.) can be integrated into local, regional, and State transportation improvement programs and plans. It is important for all parties involved in the RSA process to understand the intent and extent of these programs as they pertain to the area being studied so that safety issues may be addressed in an appropriate timeframe.

Transportation agencies are charged with developing long-range plans for the transportation systems on State, Tribal, and Federal lands. Examples include the Transportation Improvement Program (TIP), Statewide Transportation Improvement Program (STIP), Tribal

Transportation Improvement Program (TTIP), Comprehensive Conservation Plan (CCP), and General Management Plan (GMP). A major component of these plans is a comprehensive transportation study which identifies short- and long-term needs. The findings on an RSA are important to fully addressing these needs.

A brief description of the identified programs and plans is provided. For specific information regarding the long-range plans in your area, contact your State DOT, Tribal DOT, or FLH. Figure 3 illustrates how RSAs contribute to the overall planning process.

- **Transportation Improvement Program (TIP):** The TIP is a regional prioritized, fiscally-constrained, and multi-year list of Federally-funded, multimodal transportation projects. Specifically, the TIP covers at least a four-year program of projects and is updated every few years. Projects in the TIP are prioritized at the regional level and have clearly identified funding sources. The TIP represents an agency's intent to construct or implement a specific project and the anticipated flow of Federal funds and matching State or local contributions. The TIP is incorporated in the Statewide Transportation Improvement Program (STIP).
- **Statewide Transportation Improvement Program (STIP):** The STIP is a financially-constrained list of transportation projects consistent with the State long-range transportation plan and other regional plans. The STIP includes all capital and noncapital projects that are targeted to use Federal Highway Administration or Federal Transit Administration (FTA) funds. The STIP also includes all regional TIPs and the portion of the Indian Reservation Roads, Forest Service, Fish and Wildlife Service, or National Park Service TIP applicable to that State.
- **Tribal Transportation Improvement Program (TTIP):** The TTIP is similar to the TIP, but is the list of Tribal transportation projects to be funded in the next few years. The TTIP is a list of proposed transportation projects developed by a Tribe based on the Tribal priority list or the long-range transportation plan. The TTIP contains all projects funded by the IRR program and scheduled for construction in the next three to five years. It also includes other Federal, State, county, and municipal transportation projects initiated by or developed in cooperation with the Tribal government. For more information on developing a TTIP, refer to *Developing the Tribal Transportation Improvement Program* (FHWA-HEP-08-003) available online at: http://www.tribalplanning.fhwa.dot.gov/training_ttip_module.aspx.
- **Comprehensive Conservation Plan (CCP):** A CCP is required by law for all lands within the National Wildlife Refuge System. A CCP is a document that provides a comprehensive framework for guiding refuge management decisions. The National Environmental Protection Agency (NEPA) requires CCPs to examine a full range of alternative approaches to refuge management. CCPs are also intended to encourage public involvement in selecting alternatives that are best suited to a refuge's purposes. Refuge transportation studies have been used to develop the transportation component of CCPs. These studies have examined the core transportation network within a refuge, identifying short- and long-term transportation, capital, and maintenance plans for future programming.

- **General Management Plan (GMP):** A GMP is the National Park Service's version of the CCP (see description above).
- **USDA Forest Service Strategic Plan:** The plan provides strategic direction to the Forest Service's commitment to its mission. The programs and budget are aligned to meet the goals and objectives contained within the plan. Through this programming, the Forest Service is capable of providing financial and technical assistance in collaborative efforts with States, Tribes, local communities, and other partner agencies. One component of the plan is the condition of the transportation infrastructure, including off-highway vehicle access.

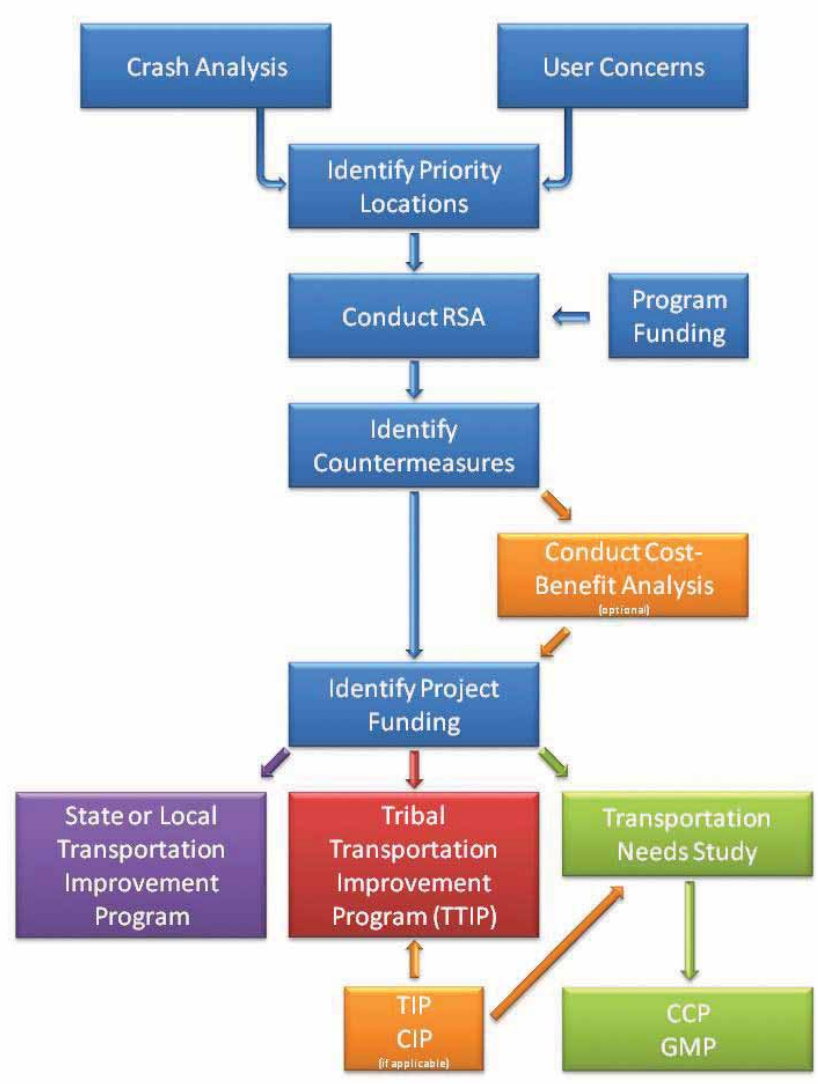

FIGURE 3: RSAS IN THE PLANNING PROCESS

WHAT CHALLENGES WILL I FACE AND HOW DO I OVERCOME THESE CHALLENGES?

Much like the challenges faced when establishing an RSA program, similar challenges may be realized when incorporating an RSA program into the planning process. Identifying appropriate partners and obtaining funding is described in Chapter 3. Other challenges include the availability of data and jurisdictional boundaries.

Data Quantity and Quality – For many RSAs conducted on Federal and Tribal lands, the lack of data and/or the poor quality of available data are issues when identifying and prioritizing locations. In many instances, crashes are not formally documented. When documents have been prepared, the data may be incomplete or inaccurate. These data constraints do not help pinpoint locations in need of attention or provide a good understanding of the safety hazards, thus making it difficult to program appropriate measures into transportation improvement plans.

CASE STUDY

An RSA conducted on the Savannah National Wildlife Refuge study area revealed that many run-off-the- road crashes were not reported as a result of the location of the crash. Vehicles involved in run-off-the-road crashes along a State roadway going through the refuge were not represented in the crash reports; once the vehicle leaves the roadway it enters Federal refuge property. The motorist is responsible for removing the vehicle and it is not reported by the police.

The lack of data and/or the poor quality of available data can be overcome by using alternative methods for identifying and prioritizing locations for RSAs. Consulting with local law enforcement, emergency medical services, health services, and/or the public can help with the identification of common issues and problematic locations that could be considered as potential candidates for an RSA. Law enforcement and public input provides anecdotal information that often helps create a more complete picture of potential hazards even without

quantifiable data. The inputs to the process can be a combination of objective and subject measures depending on the availability, quality, and detail of the data (see Chapter 2).

Jurisdictional Boundaries – Ownership of facilities or projects involving Federal or Tribal lands can be unique. For example, an RSA may be conducted on a state-owned roadway that travels through or adjacent to a Federal land. In other cases, local agencies such as counties, townships, and villages may also have roadway jurisdiction. When a facility or project is under multiple jurisdictions, there are multiple interests that are involved. One challenge is to ensure that all parties affected by programs or initiatives are well informed and that concerns are received and addressed appropriately. Another challenge is to determine which jurisdiction is responsible for planning and implementing changes, performing maintenance activities, providing enforcement, and keeping up-to-date records. This can become particularly difficult when multiple agencies are involved, especially when staffing and financial responsibility must be assigned. It is important to realize, though, that while the ownership of a facility or project can be very complex and present difficult challenges, there are also benefits of multi-agency involvement. For example, funding for reconstruction and maintenance may be limited for an individual agency, but options can be identified for pooling resources to implement suggested RSA improvements.

CASE STUDY

An RSA for the Navajo Nation was conducted along N-35. The portion of the N-35 corridor studied is a Federal Aid Highway. A portion of the roadway (milepost 0 to 18) is owned by the Bureau of Indian Affairs. The Phillips Oil Company paved a section of N-35 (milepost 18 to 23), but road ownership remains with the Navajo Nation. Funding for reconstruction and maintenance of N-35 comes from several sources, including the Indian Reservation Roads Program, Congressional earmarks, and the BIA road maintenance program. The funding for road improvements is administered by the Navajo Region Division of Transportation (NRDOT) through the IRR Program within the Federal Lands Highway Program. Funding for road maintenance comes from the Department of the Interior (DOI) and is also administered by the NRDOT. They have contracted San Juan County to maintain much of the roads in the county, including N-35. San Juan County is responsible for signing, pavement markings, and roadside mowing.

Effective communication between all parties in the RSA process is important to overcome jurisdictional boundaries. It is also important to understand how the RSA process and the resulting suggestions for improvement fit into the planning process for each agency, region, and/or State. Through partnerships, many DOTs have created formal initiatives with FLMAs and Tribes to ensure that each agency's interests are addressed through the planning process while minimizing negative impacts or feelings by any party involved (see "Who should I partner with to integrate an RSA program in the planning process?"). It is also important that other local and regional stakeholders (e.g., MPOs and COGs) buy into the RSA process and realize the benefits of the suggested improvements so that the program gains support, relationships form and grow, and measures continue to be programmed.

CHAPTER 5: WHAT'S NEXT?

This chapter summarizes the key points presented in the Toolkit, providing guidance regarding what can be done to move forward in establishing an RSA program and conducting RSAs. Further information related to the available references to aid in this process can be found in the Resource Materials section.

HOW DO I START?

The following are key elements of starting an RSA program.

- ✓ **Coordinate with other Partner Agencies** – Partnering with other agencies will prove beneficial for Federal and Tribal land agencies, as resources can be combined to target a central goal: improving roadway safety. Partnering opportunities should be considered not only when establishing an RSA program, but also when incorporating RSAs into the planning process. Partnering between State DOTs and FLMAs or Tribes can greatly improve communication and increase inter-agency participation and cooperation.
- ✓ **Identify Problematic/High-Crash Locations** – One of the key components of conducting a successful RSA is to select locations with safety issues where a benefit can be realized. For facilities on Federal and Tribal lands, it may prove difficult to adequately understand crash problems as data may be insufficient to identify trends. The best effort must be made to use available data and anecdotal information to select the most problematic and hazardous locations so that resources are used effectively and efficiently.
- ✓ **Decide on an RSA Approach** – Depending on experience, personnel, and funding, FLMAs or Tribes can consider several options to conduct RSAs. For those agencies with little or no experience, issuing a Request for Proposal would solicit an experienced outside lead for the RSA team (typically a consulting firm). Agencies with some experience and available resources may request assistance from the local or State transportation agency. Finally, for those agencies wishing to conduct RSAs on their own, training courses should be scheduled prior to actual field reviews. The National Highway Institute provides a training course (FHWA-NHI-380069) for performing effective RSAs (http://www.nhi.fhwa.dot.gov/training/training_products.aspx).
- ✓ **Obtain RSA Materials** – Prior to conducting RSAs, agencies should become familiar with the overall process as well as specific details and issues to be looking for in the

field. The Resource Materials section provides various resources with regard to demonstrating the usefulness of RSAs, assessing roadway safety, identifying potential improvements, and evaluating their effectiveness. Additional information and resources can also be obtained from attending one or more training courses and/or by visiting FHWA's website (http://safety.fhwa.dot.gov/rsa).

- ✓ **Schedule and Conduct an RSA** – Once partnerships have been formed, locations have been identified, options have been addressed, and materials have been reviewed, it is time to get the RSA process underway. Example materials to aid in scheduling, conducting, and documenting an RSA are provided in the Resource Materials section. When introducing RSAs, consideration should be given to the "top down" approach: start with pilot RSA projects under an experienced lead and work towards developing a formal RSA policy. It is important to evaluate the overall experience of the RSA after its completion, noting the pros and cons and making adjustments as necessary when scheduling and conducting the next RSA.

WHERE CAN I FIND SUPPORT?

There are a number of supporting and participatory resources available to assist Federal and Tribal transportation agencies in improving safety by conducting RSAs. Resources are also available to provide updates on the "state of practice" for RSAs as well as information about safety issues and treatments being used by others. Several examples are provided as a starting point:

- Visit the RSA Website for more information (http://safety.fhwa.dot.gov/rsa).
- Utilize the RSA Peer-to-Peer Program (http://safety.fhwa.dot.gov/rsa/resources/p2p/).
- Contact a FHWA office, LTAP or TTAP, or State/local DOT.
  - FHWA Office of Safety (http://safety.fhwa.dot.gov/)
  - FHWA Office of Federal Lands Highway (http://flh.fhwa.dot.gov/)
  - FHWA Division Office
    - Eastern Federal Lands (http://www.efl.fhwa.dot.gov/)
    - Central Federal Lands (http://www.cflhd.gov/)
    - Western Federal Lands (http://www.wfl.fhwa.dot.gov/)
- Subscribe to safety-related newsletters, such as the Road Safety Audit (RSA) Newsletter (http://safety.fhwa.dot.gov/rsa/newsletter/).
- Subscribe to relevant listservs, such as the Center for Transportation and Environment "Wildlife, Fisheries, and Transportation (WFT)" Listserv (http://itre.ncsu.edu/cte/gateway/WFTlistserv.asp).
- Attend a safety conference, such as a Tribal safety summit, when it is held in your State.

Keep in mind that implementing changes may take time. Even seemingly minor changes may require coordination with multiple agencies and may result in a change in policies or practices. However, by working together, positive relationships can be established that will provide longer-term benefits in all efforts to improve safety…all it takes is commitment.

RESOURCE MATERIALS

This section includes resources that will be helpful in establishing an RSA program, conducting RSAs, and identifying potential improvements. Sample materials that can be used to conduct and document RSAs are also provided.

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Sample Request for Proposal

The following is a general outline of a Request for Proposal (RFP) for an RSA. For each section, a brief explanation of the information to be included in the RFP is provided. The RFP generally follows the 8-step RSA process, however, the requesting agency may wish to include additional tasks or eliminate tasks based on specific needs. Federal Land Management Agencies and Tribes may draft and issue a request for engineering consultant services to lead one or a series of RSAs on their lands. Typically, RFPs generate responses from several consultants and requires the issuing agency to award a contract based on the consultant's ability to adequately perform the work and the cost at which the work can be completed.

PROJECT DESCRIPTION: Provide a brief overview of the Consultant's responsibilities, a brief description of the RSA, and how the RSA will be conducted.

ANTICIPATED SERVICE START AND END DATES: Identify start and end date of services.

PREQUALIFICATION CLASSIFICATION: Identify any stipulations to establish the type(s) of work the Consultant must be qualified to perform.

DBE REQUIREMENT: Identify any Disadvantaged Business Enterprise (DBE) requirement(s) the Consultant must satisfy to be eligible for consideration for award of contract.

PROJECT MANAGER: Provide the name and contact information of the person(s) overseeing the execution of the scope of services. This person is typically from the requesting agency.

GENERAL BACKGROUND: Provide a brief description of the purpose and objective of the services being requested.

OBJECTIVES AND TASKS OF THE PROPSED PROJECT: Provide a detailed task-by-task description of the work to be completed to meet the purpose and objective of the services being requested.

Identify Multidisciplinary RSA Team (Optional: can be completed by owning agency as described in Chapter 1).

- Identify team leader to conduct RSA.
- Determine required disciplines and individuals to serve on RSA team.
- DELIVERABLES: Provide a list of names and contact information for each RSA team member; submit a schedule of RSA activities.

Prepare Relevant Data and Documents

- Obtain available relevant data and documents needed for RSA, including but not limited to project scope, location, crash history, traffic volumes, aerial photographs, design drawings, and planned improvements at the site and in the vicinity of the site.
- Create collision diagram and summary of crash data (e.g., crashes by year, type, severity, light condition, weather condition, day of week, and month of year).
- Provide all pertinent data and documents to RSA team members.
- DELIVERABLES: Provide a copy of all information to each RSA team member.

Conduct RSA Briefing Meeting

- Schedule and lead meeting to introduce RSA team members and establish roles; explain RSA scope, objectives, and goals; discuss project data (crash documents, traffic volumes, aerial photographs, design drawings, etc.); establish completion schedule.
- DELIVERABLES: Provide a copy of the meeting minutes to the Project Manager(s).

Perform Field Reviews

- Establish time of day to conduct field reviews.
- Provide equipment to perform reviews: safety vests and hats, camera, measuring instruments.
- Identify travel arrangements to the site.
- Designate specific field assignments for each RSA team member.
- Observe road user behavior, geometric and operational characteristics, surrounding land uses.
- DELIVERABLES: Documentation of field observations through photos, field review notes, and sketches (optional: video recording).

Conduct Debriefing Meeting

- Discuss and consolidate RSA team findings.
- Prioritize identified safety issues.
- Formulate potential recommendations.
- Conduct a preliminary review of findings and recommendations with Project Manager(s).
- DELIVERABLES: Summary of RSA team findings and prioritized safety improvements.

Prepare Draft RSA Findings Report

- Prioritize and categorize safety issues with recommended improvements (see the Resource Materials section for a report template).
- Conduct preliminary cost estimates and B/C analyses (optional).
- DELIVERABLES: Provide draft report to RSA team members for review and comment prior to submitting to the Project Manager.

Conduct Cost Analysis

- Provide cost analysis (quantity estimating and B/C analyses) to support safety improvement recommendations (may be planning-level or detailed construction estimates).
- Categorize recommendations as low-, medium-, and high-cost improvements.
- DELIVERABLES: Summary of cost analysis and list of recommendations by priority and category.

Present Draft RSA Findings Report

- Present findings to Project Manager(s).
- DELIVERABLES: Provide a copy of the draft RSA report, including all pertinent supporting documentation.

Submit Final RSA Findings Report

- Address and incorporate all comments from presentation of draft report.
- Submit final report to Project Manager(s) in accordance with schedule.
- DELIVERABLES: Provide copy of final RSA report, including all pertinent supporting documents.

CONSULTANT RESPONSIBILITIES: Provide details of the Consultant's contractual responsibilities to fulfill the scope of services being requested. This may include principal contacts, materials and equipment, funding compliance, personnel, and progress reporting.

HOST AGENCY RESPONSIBILITIES: Provide details of the hosting agency's responsibilities to the Consultant to fulfill the scope of services being requested. This may include provision of documentation, transportation, and any relevant information needed for the RSA.

PAYMENT SCHEDULE: Provide information with regard to how the Consultant will be compensated for completing the scope of the services being requested. Also establish a billing schedule and other terms and conditions of compensation.

Sample RSA Application

The following is an example of an application to request assistance to conduct an RSA. This may be used when requesting an RSA on a roadway adjacent to Federal or Tribal lands that is owned by a State or local DOT. Applications such as this are used by agencies that have a formal RSA request process in place; however, the information in the application may be included in any type of correspondence to an owning agency (State or local agency) to request an RSA.

ROAD SAFETY ASSESSMENT APPLICATION

1. Name, Position/Title, Address of Contact Person:
   _____ Phone Number: _____
   _____ Fax: _____
   _____ Email: _____
2. Type of assessment requested (planning, design, construction, existing): _____
3. Specific location of proposed RSA project (intersection, spot location, road segment or project, or new facility):
   Route(s): _____ Segment: _____ Project: _____
   From/To (if segment/project): _____ Segment Length: _____
   City/County/Tribe: _____
4. Describe any improvement plans, including stage (scoping, design, construction, etc.), for this location:
   _____
   _____
5. Reasons for requesting RSA:
   _____
   _____
6. What is the crash experience for the most recent 3-year period (total crashes, fatal crashes, injury crashes, crash rate, etc.)? (not applicable for new facility) _____
   _____
7. Does your agency have a method to identify and prioritize road safety issues? _____ If yes, where does this location rank within your agency's problem locations? _____
8. Average Daily Traffic (ADT) volume for road(s): _____
9. Please list month and/or days of week when safety issues are most prevalent, if applicable: _____
   _____
10. Describe any future development planned for this area:
    _____
    _____
11. Please include any additional road owners, photos and/or other information that highlight the location:
    _____
12. Signature (and printed name) of Person with Authority to Respond To/Implement the RSA Findings:
    _____ Date: _____

Submit Application to: NAME PHONE
ADDRESS FAX
EMAIL

Sample RSA Agenda

The agenda helps set the course of events for the RSA process. In addition to setting a time schedule, it also provides direction to all parties involved as to who should partake in the various activities. The agenda is created by the RSA team and provided to all participating parties prior to the RSA.

RSA Location	
Agenda	
Day 1	**Date**
9:00 - 9:30 AM	Introduction to RSA Process
9:30 - 10:00 AM	Project objectives/background
10:00 - 12:00 PM	Intial site visit by car
12:00 - 1:00 PM	Lunch
1:00 - 5:00 PM	Detailed site review
5:00 - 6:30 PM	Peak hour review
6:30 - 8:30 PM	Dinner
8:30 - 9:30 PM	Nighttime site review
Day 2	**Date**
7:30 - 9:30 AM	Continue detailed site review
10:00 - 12:00 PM	Individual assignments
12:00 - 1:00 PM	Lunch
1:00 - 3:00 PM	RSA team develops workshop summary
3:30 - 4:30 PM	Preliminary Findings Meeting
	General meeting – all need to attend especially "roadway owners" (i.e., persons responsible for development of plans and/or facility owner)
	RSA team activity – all who are interested in participating in the site visits and developing suggestions (excluding roadway owners)
	Optional RSA team activity – not required, but welcome all who are interested in participating

Typical Data for Conducting RSAs

The following data elements are typically requested for conducting RSAs. Those data elements that are most important are notated with an asterisk (*). The data is requested prior to conducting the RSA so that the team has an opportunity to review and become familiar with the characteristics of the study area. Depending on the extent of the data provided, summary tables and graphics may be created to make the information more manageable for field review activities and presentation purposes. It is recognized that this data may not be available, but lack of data does not prevent an RSA from being conducted.

Requested Information
Traffic Volume Data (one year period)
Average vehicular daily traffic (ADT)*
Pedestrian and bicycle volumes
Vehicle classification data (percent trucks)
Turning movement counts at intersections
Crash Data (preceding three years pedestrian crashes (minimum))
Individual police crash reports*
Reference/summary crash statistics*
Crash pin maps*
Collision diagrams (usually developed by RSA team)
Other Pertinent Information
Aerial photographs of study area*
Location of pedestrian generators*
Previous safety study reports (if any)*
Inventory of existing pedestrian and bicycle facilities (e.g., sidewalks, curb ramps, trails, greenways)
Locations of schools
Future/existing roadway, signing and marking, and signalization plans
Transit route information (ridership if available)
Vehicle speed data (measured speeds and speed limits)
School bus/walking route (safe routes to school) information
Agency and citizen correspondence pertinent to study area
Future development plans

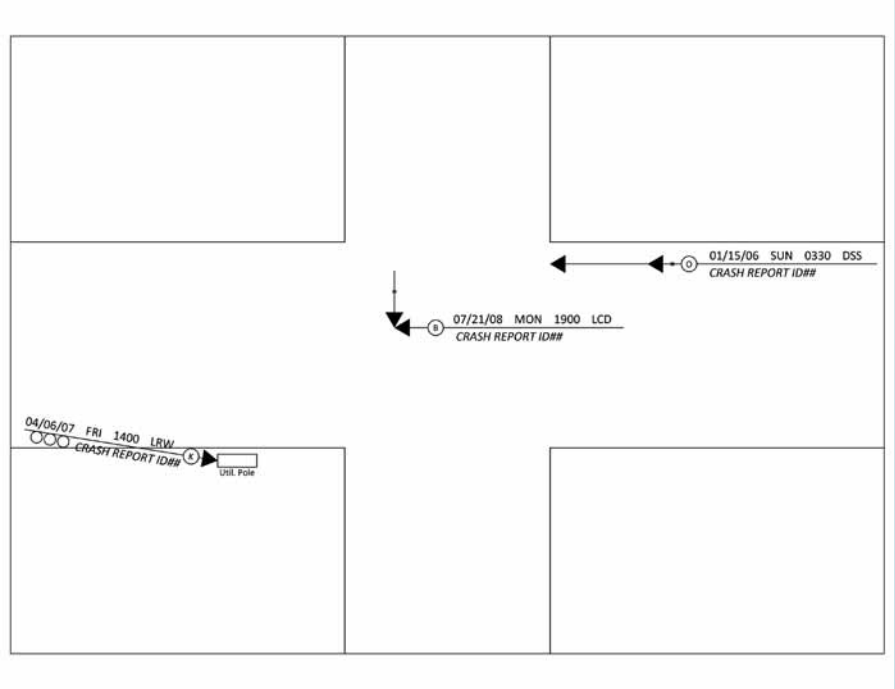
*High-priority data

Sample Collision Diagram Worksheet

Collision diagrams use symbols to illustrate the location of crashes by crash type. The diagrams help the RSA team to identify patterns in crashes. Information provided on the collision diagram may include time of day, day of the week, light conditions, weather conditions, surface conditions, and severity level. Corresponding document numbers may also be included as a reference to a detailed crash report. Collision diagrams may be obtained from the owning agency (if available) or may be produced by the RSA team if crash reports are provided. Ideally, the diagrams should be obtained or produced prior to the start-up meeting (Step 3 of the RSA process).

The example collision diagram demonstrates how crashes can be illustrated:

- Crash #1: Two vehicles are traveling westbound on Sunday, January 15, 2006 at 3:30 AM. Vehicle #1 stops for a red signal. Vehicle #2 is following too closely and does not stop in time, rear ending Vehicle #1. Weather conditions are snowy with snow on the roadway. The crash results in property damage only to both vehicles.
- Crash #2: Vehicle #1 is traveling westbound and Vehicle #2 is traveling southbound on July 21, 2008 at 7:00 PM. Vehicle #1 has a green signal. Vehicle #2 runs the red signal, crashing into the passenger's side of Vehicle #1. Weather conditions are clear and the pavement condition is dry. The crash results in a B severity injury for Vehicle #1.
- Crash #3: A single vehicle is traveling eastbound on Friday, April 6, 2007 at 2:00 PM. The driver has a medical emergency and runs off the roadway to the right. The vehicle strikes a utility pole, killing the driver. Weather conditions are rainy and the pavement condition is wet.



COLLISION DIAGRAM

N/S: _____ TIME PERIOD: _____

E/W: _____ DATE: _____

LEGEND

Moving Vehicle	Driver at Fault	Light:	Weather:
Parked Vehicle	Pedestrian	L = Daylight	C = Clear or Cloudy
Fixed Object	Bicycle / Moped	DN = Dawn	R = Rain
Head On	Deer / Animal	DU = Dusk	S = Snow/Ice
Rear End	(K) Fatal Crash	D = Dark	X = Other/Unknown
Right Angle	(A) A Injury Crash	X = Other/Unknown	
Turning	(B) B Injury Crash		
Backing	(C) C Injury Crash		
Sideswipe	(O) Property Damage Only Crash		
Out of Control			

Surface:
D = Dry
W = Wet
S = Snow/Ice
X = Other/Unknown

YEAR	TIME OF DAY			PVMT COND			TYPE OF COLLISION										SEVERITY					TOTAL
	DAY	DAWN/ DUSK	DARK	DRY	WET	SNOW/ ICE	RA	RE	LT	RT	HO	SS	BY	FXD OBJ	PED	OTH	K	A	B	C	O	

Sample Field Notes Worksheet

Documenting potential safety issues is an important part of the RSA field review process. The notes taken by the RSA team in the field are used to conduct the RSA analysis and prepare the findings report. In addition to field notes, an aerial photo can be useful to annotate issues and comments, rather than sketching the location by hand. Photographs (and video recordings, if desired) of identified safety issues should also be taken as a further means of documentation. This worksheet is intended to be used during Step 4 of the RSA process.

INTERSECTION / SEGMENT: _____

RSA TEAM MEMBERS: _____

_____

_____

DATE: _____

TIME OF DAY: _____

FIELD NOTES

Roadway Conditions

Roadside Conditions

Signing & Pavement Marking Conditions

Road User Conditions

What Materials Do I Need for the Field Review?

The following list provides a number of possible materials that could be taken by an RSA team member into the field when conducting reviews. Not all of the materials on this list are absolutely necessary, but should be strongly considered. Any other materials that do not appear on this list but are thought to be essential to the field review should be included.

- ✓ Reflective Safety Vests (and helmets, if required)
- ✓ Vehicle to collectively transport all RSA team members
- ✓ Magnetic rotating beacon/emergency vehicle flashers
- ✓ Temporary traffic control sign (e.g., "Road Work Ahead", "Survey Crew"), if desired
- ✓ RSA Agenda
- ✓ Field Notes Worksheet
- ✓ Writing Implements and Paper/Notebook
- ✓ Crash Data (if available)
  - ✓ Collision Diagrams
  - ✓ Pin or GIS Maps
  - ✓ Summary Charts and Graphs
- ✓ Aerial Photographs or Schematic of RSA Study area
  - ✓ Google Maps: http://maps.google.com/maps?hl=en&tab=wl
- ✓ RSA Prompt Lists (from *RSA Guidelines* and *Pedestrian RSA Guidelines and Prompt Lists*)
- ✓ GPS/Directions
- ✓ RSA Team Member Phone List
- ✓ Digital Camera and Extra Batteries
- ✓ Video Recording Device (if desired)
- ✓ Measuring Wheel
- ✓ Grade Level (or carpenter's level and tape measure)
- ✓ Personal Items (Bottled Water, Light Snack; Hat/Sunglasses, Sunblock)

Sample RSA Report Outline

The following provides a general framework of the components and structure of a RSA report.

1. **Cover** – include project name, location, and date.
2. **Introduction** – include objectives, background, and study team.

   Objectives of Study

   Background

   Study Team

3. **Existing Conditions** – identify existing geometric conditions, discuss traffic conditions, and present crash history.

   Geometric Conditions

   Traffic Data

   Crash Analysis

4. **Assessment Findings** – describe the safety benefits of existing features, present the RSA framework, and summarize the identified issues and suggestions for improvement.

   Safety Benefits of Existing Roadway Features

   RSA Framework

   Summary of Identified Safety Issues and Suggestions for Improvement

5. **Conclusions** – provide a brief summary of the major safety issues and discuss any potential to incorporate multidisciplinary improvements, including enforcement and education.
6. **References** – provide a list of references used to complete the RSA or identify potential countermeasures.
7. **Appendix: Detailed Discussion of Issues and Suggestions** – provide a more detailed discussion of each issue identified and summarized in Section 4 "Assessment Findings."

Sample Presentation of Issues and Suggestions

The following examples illustrate different methods of presenting the safety issues and proposed suggestions discovered and developed during the RSA. This information would appear in Section 4 "Assessment Findings" of the sample report outline.

Example 1: Portrait Layout (Two-Column Format)

Issue 2: Roadside Hazards

2.1 Fixed objects near roadway: *There are several fixed objects along the corridor in close proximity to the roadway, particularly within curves. Fixed objects along the corridor include trees, utility poles, embankments, and culverts.*

Based on crash data from 2006 to 2008, 30 of the 47 crashes along the corridor were run-off-road, 18 of which involved a fixed object. Of the 18 fixed object crashes, seven involved a tree, six involved a utility pole, and five involved an embankment.

Suggestions:

Short-term - Delineate fixed objects that are close to the roadway using post-mounted delineators or retro-reflective tape as appropriate.

Intermediate – Consider removing trees and other fixed objects that are within the clear zone, particularly along the outside of curves.

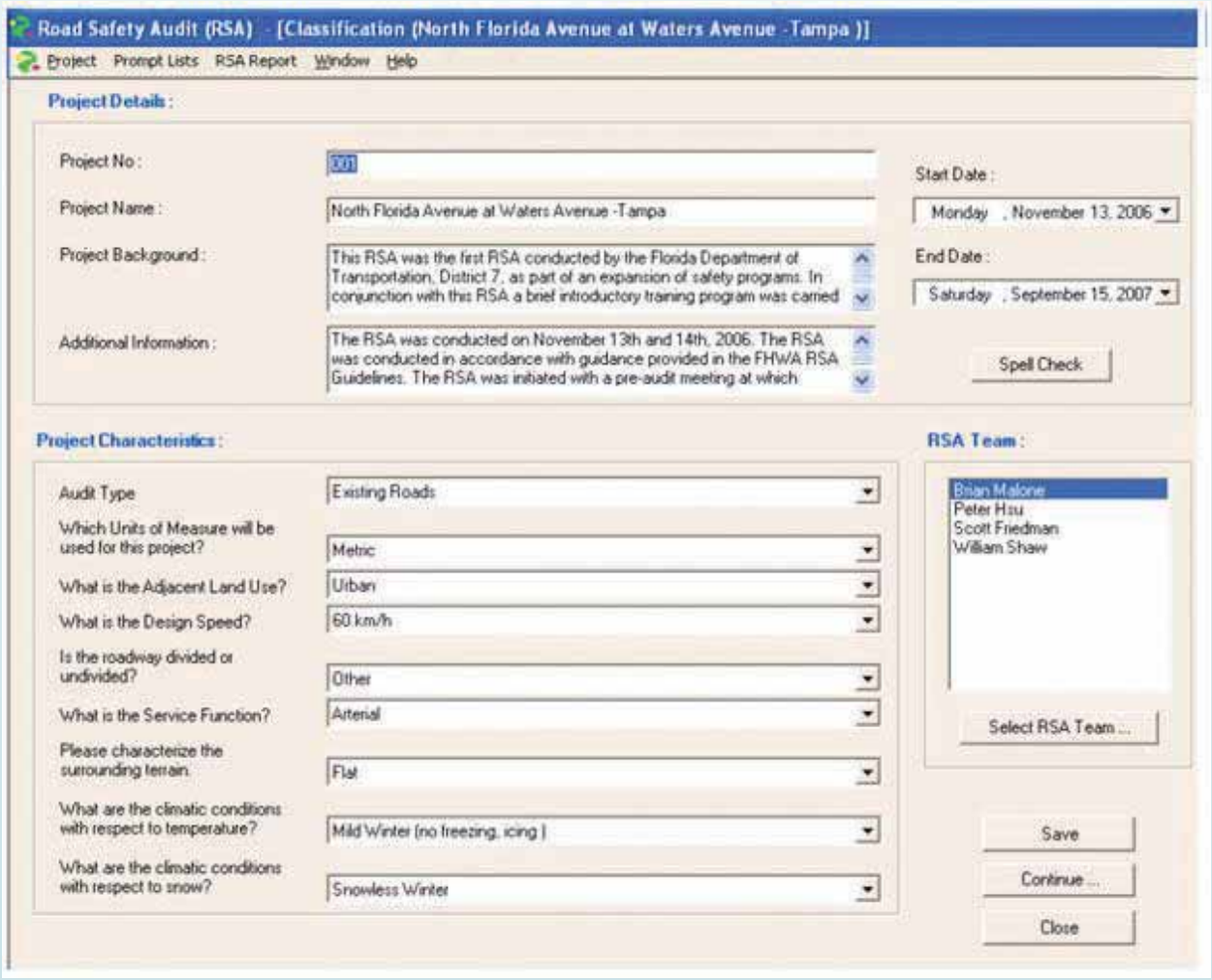
Long-term – Consider relocating utility poles to the inside of horizontal curves, where they are less likely to be struck. Consider increasing the pavement width to create a consistent cross-section and provide more room for recovery.

Photo shows the lack of a paved shoulder and close proximity of fixed objects to the roadway.

Primary Issue: Animals on the Roadway		
Specific Safety Concern	**Suggested Improvements**	**Example of Issue**
Animals—the roadside throughout the study area is open range. Horses, cows, and sheep were observed crossing and grazing along the roadway during daytime and nighttime conditions. Animal-related crashes represented approximately 25% of all crashes along the corridor.	*Short-Term* – Utilize reflective ear tags, branding, or other strategies to increase the conspicuity of animals at night. *Intermediate* – Consider installing an animal fence along the corridor. This may be a challenge as the County does not provide any right of way fencing on county roads. This may require coordinating with the grazing official to support the effort. *Long-Term* • Engage animal owners regarding economic loss and better control of animals. • Consider working with elected officials toward efforts to prohibit open range grazing and couple this with local enforcement. The enforcement component is critical because legislation alone will have limited effectiveness without actual consequences.	 VIEW OF THE CORRIDOR WITHIN THE STUDY AREA. PHOTO SHOWS A HORSE CROSSING THE ROAD, WHICH WAS A COMMON OBSERVATION DURING THE RSA.

RSA Software

The Road Safety Audit (RSA) software is a tool for assisting with the completion of RSAs. The software facilitates team members in the collection of information as they proceed through the RSA process. It gives users access to comprehensive prompt lists and reduces the potential for users to simply "check" issues off a list. The prompt lists are presented at different levels of detail, helping users to identify issues that may be overlooked in the RSA process. With the software, users can link identified issues to user-defined locations in the study area and provide accompanying comments with each issue. It also allows users to record suggestions for improvements that may be identified. Finally, output from the RSA software groups findings by issue and exports the results to a Word-compatible file that allows for quick completion of a formal RSA report. The software is available for download on FHWA's Office of Safety website (http://safety.fhwa.dot.gov/rsa/software/).



What Resources are Available for Demonstrating the Usefulness and Effectiveness of RSAs?

Road Safety Audits: Case Studies (FHWA-SA-06-17), March 2007
http://safety.fhwa.dot.gov/rsa/case_studies/fhwasa06017/fhwasa06017.pdf

Tribal Road Safety Audits: Case Studies (FHWA-SA-08-005), September 2008
http://safety.fhwa.dot.gov/rsa/tribal_rsa_studies/tribal_rsa_studies.pdf

Federal and Tribal Lands Road Safety Audits: Case Studies (FHWA-FLH-10-05), December 2009
http://flh.fhwa.dot.gov/programs/irr/safety/documents/trsa-case-studies-2.pdf

Recent Uses of Road Safety Audits (RSAs) in Highway Safety Improvement Programs and Strategic Highway Safety Plans (TRB Paper 09-2492)
TRB 88th Annual Meeting Compendium of Papers DVD

Selected Examples of Tribal Road Safety Audits (RSAs) in the United States (TRB Paper 10-1284)
TRB 89th Annual Meeting Compendium of Papers DVD

What Resources are Available for Assessing Safety on Our Roadways?

FHWA Road Safety Audit Guidelines (FHWA-SA-06-06), 2006
http://safety.fhwa.dot.gov/rsa/guidelines/documents/FHWA_SA_06_06.pdf

Pedestrian Road Safety Audit Guidelines and Prompt Lists (FHWA-SA-07-007), July 2007
http://drusilla.hsrc.unc.edu/cms/downloads/PedRSA.reduced.pdf

Road Safety Audits/Assessments Training Course (FHWA-NHI-380069)
http://www.nhi.fhwa.dot.gov/training/nhistoresearchresults.aspx?topicnum=380

usRAP
http://www.usrap.us/home/

Roadway Safety Tools for Local Agencies (NCHRP Synthesis 321)
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_321.pdf

SAFER Manual, Transportation Information Center, University of Madison-Wisconsin, 1996
http://www.t2.unh.edu/nltapa/Pubs/SAFER_96.pdf

RSA Toolkit DVD
http://safety.fhwa.dot.gov/rsa/resources/toolkitcd/

What Resources are Available for Identifying Potential Improvements and Evaluating Their Effectiveness?

NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan Transportation Research
http://www.trb.org/Main/Public/Blurbs/152868.aspx

NCHRP Report 622: Effectiveness of Behavioral Highway Safety Countermeasures
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_622.pdf

Sign Retroreflectivity Manual: How to Meet the New National Standard for Small Agencies, Federal Land Management Agencies, and Tribal Governments (FHWA-CFL/TD-09-005), July 2009
http://safety.fhwa.dot.gov/roadway_dept/night_visib/retrotoolkit/

Roadway Safety Guide, Roadway Safety Foundation
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