



Imagining the Second Strategic Highway Research Program in Action

A Product Showcase Scenario

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As the second Strategic Highway Research Program (SHRP 2) heads toward completion, transportation agencies will be interested in the outcome of the program's strategic goals. The four goals are

1. To develop a consistent and systematic approach to renewing America's highways rapidly while minimizing disruption and producing longer-lasting facilities—addressed in the Renewal focus area;
2. To improve highway safety significantly—addressed in the Safety focus area;
3. To provide a highway system with reliable travel times—addressed in the Reliability focus area; and
4. To develop approaches and tools that systematically integrate environmental, economic, and community requirements into the analysis, planning,

and design of new highway capacity—addressed in the Capacity focus area.

Points of Entry

These are grand goals, and success will depend on the adoption of SHRP 2 products into general transportation practice. Transportation agencies, however, will want to know how the products apply in practice and what benefits they can gain before adopting new technologies, procedures, and practices, no matter how innovative.

Each agency is unique, with its own needs, priorities, conditions, and finances; therefore each must decide which products or groups of products are the best starting point for implementation. Finding that point of entry requires a clear picture of the nature and application of the SHRP 2 products; guidance in formulating the questions would be helpful. The

SHRP 2 research aims for safer highways, reliable travel times, and better approaches to renewing highway facilities and planning new capacity. SHRP 2 has developed a hypothetical, highway-focused scenario to illustrate the everyday applicability of its products.



PHOTO: JIM RICH, FLICKR

Map of the imaginary SR-85 highway corridor, used to illustrate the multidisciplinary applications of SHRP 2 products.



implementation teams assembled by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) will assist agencies in implementation activities, but some simple illustrations of how and where SHRP 2 products might be deployed will help agencies articulate their first questions.

Puzzling Out an Illustration

SHRP 2 products vary markedly and apply to different phases of transportation project delivery. Some look and sound as though they emerged from traditional research programs—the design standards developed for prefabricated concrete bridges are an example. Highway professionals can readily grasp the underlying concepts and recognize the value of application. Other products seem abstract and unfamiliar when described, and picturing how such a product would be applied in practice is not easy; the Transportation for Communities: Advancing Projects Through Partnerships (TCAPP) product is an example.

Because of this breadth of applications, different

people within an agency will evaluate the SHRP 2 products from the perspectives of their own specialties, and the product's overall value to an agency may not be obvious. For instance, how will TCAPP and new methods to identify pavement delamination both accelerate project delivery?

Within a transportation agency, planners are likely to evaluate one product and pavement engineers the other. Yet a strategic connection bridges the two disciplines—both products will improve project decision making and will limit the time lost in revisiting decisions made in the planning and design phases of project delivery.

This concept is difficult to describe, much less to illustrate, but illustrations can help transportation agencies and their industry partners invest wisely in implementing SHRP 2 products. Late in 2011, SHRP 2 staff and researchers negotiated the initial turn from research to implementation and puzzled over how to illustrate the potential applications of SHRP 2 products and the strategic connections among them.

A realization emerged that the connecting ele-

ment was the highway. This insight led to the development of a scenario that focused on the highway and not on the SHRP 2 products. The canvas for the scenario featured an imaginary highway corridor that could illustrate real-world applications of various SHRP 2 products and how they might work together to meet an agency's needs and thereby fulfill the SHRP 2 goals. This device was useful in showing how frequently SHRP 2 products could apply and how frequently the SHRP 2 products complemented each other, even when applied at different times in the life cycle of a highway.

Painting the Vision

The canvas for painting the vision of product applications featured a hypothetical State Route 85 (SR-85) that runs between Old Town and New Town. The road is showing the stresses and strains of increasing age and expanding traffic. Cultural and natural features are likely to pose challenges to plans to operate, renew, expand, or relocate the road.

The following sketch captures the essence of the road from Old Town to New Town, the road's conditions, geographical situation, and some assumptions about the region. Although fictional and planted with features to showcase SHRP 2 products, the road from Old Town to New Town has the feel of an everyday highway. Agency planners and engineers should find it familiar and, equipped with SHRP 2 product descriptions, could reproduce the exercise. Agencies considering implementation of SHRP 2 products may find it useful to repeat this exercise with real highway segments from their own networks.

The Road

Old Town and New Town are approximately 40 miles apart on SR-85. Old Town was founded in the late 1700s and grew into a city in the 1820s with construction of the Big Muddy River Canal, which is no longer in use. Many Federal and Victorian period buildings line the waterfront but are falling into disrepair. Old Town has hopes for gentrification. Although slowly losing population, Old Town remains the employment center of the region, mostly with light industry.

A few miles to the southeast of Old Town is the Hamlet, the original colonial settlement, with an agricultural history. A handful of colonial homes, some on the National Register of Historic Places, line either side of "The Street," as SR-85 is called in the Hamlet. The Street has become a destination for day-tripping tourists. Rumors of an old fort in the vicinity persist, but no ruins have been found.

New Town grew up after the Western and Pacific (W&P) Railroad came through, circa 1900. Another

growth spurt occurred when Interstate 50 (I-50) was constructed around 1970, but growth has stagnated since then. Lately, several new housing developments have popped up in the vicinity of New Town. Most of the breadwinners commute to jobs in Old Town. Plans for a new intermodal freight transfer facility near New Town have found support in the business communities of both New Town and Old Town.

The Forest and the Park

The forest covers a broad swath of land between the Hamlet and New Town. Although parts of the forest are privately owned, the state-owned areas east of the appropriately named Little Pristine River have never been logged and may be the habitat of several rare and endangered species.

The state park lies inside the forest and includes major recreation areas on both sides of SR-85, including fishing access to Little Pristine River, a lake for swimming and boating, campgrounds, and a recreational vehicle (RV) park. The intersections with the access roads to the recreation areas are the sites of frequent traffic crashes. These intersections also cause nonrecurring congestion, when park access traffic conflicts with commuter and through traffic.

The Little Pristine River is notable for the purity of its waters and lively fishing. The river is the last refuge in the state for an endangered freshwater clam.

State Route 85

SR-85 is a jointed portland cement concrete road constructed in the 1930s and often resurfaced with asphalt mixes and seal coats. Frequent maintenance is required.

SR-85 constitutes the main street for both Old Town and New Town. Although traffic volumes are moderately heavy, rush hour congestion occurs on both Main Streets. Occasionally, congestion in New Town backs up the exit ramps onto the mainline of

Historic buildings in Cumberland, Maryland, front National Road, the first improved highway in the United States. SHRP 2 products can address planning issues in areas that contain historic districts, archaeology sites, business districts, or railroads.



Analysis of data from the Naturalistic Driving Study can facilitate a better understanding of road curve safety and crash prevention methods.



PHOTO: JAWRAZ, FLICKR

I-50. Nonrecurring congestion is increasing, particularly in the vicinity of the state park.

The steel truss bridges over the Big Muddy and Little Pristine Rivers are structurally sufficient but functionally obsolete—the lanes are too narrow. The bridge that carries SR-85 over the mainline of the W&P Railroad is structurally deficient, and weight restrictions are likely within the next several years.

SR-85 crosses the single track of the W&P Railroad spur at grade. The grade crossing is equipped with traditional crossing gates.

The alignment of SR-85 is generally straight, except for the infamous “85 Curve” between the forest and New Town. Although the radius of this curve conforms to design standards, and warning signs are deployed in accord with current standards, lane departures are frequent on the segment, occasionally with fatal consequences.

Interstate 50

Constructed in the late 1970s, the twin bridges that carry I-50 across SR-85 are showing deck deterioration. Joints and bearings are also suspect.

The concrete pavement ramps and bridge approach slabs reveal distress, but the mainline pavements, reconstructed in the 1990s, are in good condition.

Traffic is moderate, but truck volumes are heavy. As noted, rush hour traffic occasionally backs up onto the mainline of I-50.

SHRP 2 Research in Action

The SHRP 2 research teams of contractors and staff were asked to identify how the state transportation agency could apply specific SHRP 2 products to improve the road from Old Town to New Town. The research teams considered all phases of the potential project, from programming and planning to operations and maintenance, as they identified product applications.

The teams identified approximately 175 situations for applying SHRP 2 products. A few selected applications are described here, with the focus on the highway, beginning with a problem that the highway agency could encounter with SR-85 and discussing how SHRP 2 products may apply. The SHRP 2 products do not magically solve problems but are tools to help highway planners, engineers, and managers solve problems and make better decisions.

Problem 1. Should SR-85 be relocated to an entirely new alignment or be expanded, retaining the current alignment?

TCAPP is a robust resource for integrating environmental, economic, and community requirements systematically into the analysis, planning, and design of the alignment and expansion options.¹ TPICS, the transportation project impact component of TCAPP, can be used to determine which option is likely to provide the better eco-

¹ www.transportationforcommunities.com/.

nomic outcome.² The Decision Guide component will ensure that consensus is reached at each key decision point in the planning process and that the decisions are based on the appropriate information with the right stakeholders participating.

Problem 2. What are the ecological priorities presented by plans to expand the capacity of the SR-85 corridor?

TCAPP contains a set of tools to identify ecological priorities within a region, so that the highway planning process can avoid or minimize impacts. In all likelihood, neither the relocation nor the expansion of SR-85 will be free of impacts; therefore early identification is imperative for treating these impacts appropriately and avoiding delay. A highway solution that early on considers regional ecological priorities—as opposed to site-specific priorities—can benefit regional conservation planning.

Problem 3. How can the travel-time reliability of SR-85 be improved?

The SR-85 alignment is prone to nonrecurring congestion in the vicinity of the state park. The SHRP 2 Reliability by Design guidelines offer useful improvements to the roadway geometry, along with design tools for spot improvements at the state park and at other locations, such as the I-50 exit ramps and the Old Town and New Town business districts. The limited changes to the roadway geometry will have the secondary benefit of generally improving traffic safety.

Problem 4. How can response to traffic incidents be improved and the average incident clearance time be reduced?

In cooperation with other agencies, SHRP 2 has developed training curricula, guides, and tools to coordinate training for incident responders from public safety and transportation agencies.³ Responders who thoroughly understand the roles played by their counterparts from other agencies can interact more safely and efficiently at the scene, lowering risks for themselves and for motorists and improving agency response time.

Responders to the all-too-frequent crashes at the 85 Curve include personnel from the state department of transportation (DOT) maintenance division, state and local police, the local fire department, emergency medical and ambulance services, and local towing services. All of these responders are needed, but if they are untrained or unaware of the roles and requirements of the other

responders, the incident clearance will be delayed, causing congestion and raising the risk of secondary crashes.

Problem 5. How can the risk of crashes at the state park intersections and at the 85 Curve be reduced?

Coordinated response to incidents is essential, but not enough. Under the “do nothing” option for SR-85, traffic volumes are likely to increase, as is the number of fender benders in the park and of lane departure crashes at the 85 Curve.

Two SHRP 2 Safety Data Analysis Studies are addressing these traffic crash types and the degree to which driving behavior can increase or decrease crash risk. A third study is exploring the contributions of driver distraction and inattention to crash risk. The report, *Addressing Driver Performance and Behavior in Traffic Safety*, summarizes the Phase 1 work of four research teams that analyzed data from the SHRP 2 Naturalistic Driving Study (NDS).⁴

These analysis projects are early examples of the work that can be done with the SHRP 2 NDS and Roadway Information databases. A 2015 issue of *TR News* will address the value of these unique and unprecedented data sets.

Problem 6. What can be done with the bridge over the W&P Railroad in New Town?

Whatever the plans for highway improvements in the SR-85 corridor, replacement of the structurally deficient bridge over the railroad is a necessity. SR-85 is only 2 lanes at this point, however, and normal bridge construction practices will involve lengthy and disruptive traffic restrictions.

SHRP 2 has produced an Accelerated Bridge

⁴ www.trb.org/Main/Blurbs/168727.aspx.



PHOTO: RUDY SALAKOVY

Tools in TCAPP can help identify a region's ecological priorities, such as wetlands endangered species. In the SHRP 2 exercise scenario, the Little Pristine River is a refuge for freshwater clams (above).



PHOTO: HALL 2007

Construction of a concrete overlay on the E40/A10 road from Brussels to Ostend in Belgium. Preservation techniques to extend pavement service life are presented in the SHRP 2 Report *Using the Existing Pavement In-Place and Achieving Long Life*.

² <http://tpics.us/>.

³ www.trb.org/Main/Blurbs/166877.aspx.

Construction Toolkit that includes standard plans and design details for prefabricated bridge elements that are simple, light, and easy to erect.⁵ Fully prefabricated bridges can cut construction time from months to weeks, greatly reducing the associated disruptions for New Town.

Problem 7. What can be done to avoid delays in the project to replace the railroad bridge?

Construction projects that involve highways and railroads often experience major delays in reaching agreements between the railroad company and the transportation agency. The SHRP 2 report, *Strategies for Improving the Project Agreement Process Between Highway Agencies and Railroads*, with its associated web-based training tools, addresses successful practices for project coordination, as well as model legal agreements that have proved successful in assuring the timeliness of construction.⁶ Communications and cooperation between both parties are essential for avoiding confusion, conflict, and delay.



Problem 8. How can the deteriorating SR-85 pavement be held together until construction of a new or rehabilitated pavement?

No matter how quickly planning can progress for a new or renewed SR-85, the start of construction is likely several years away, and the highway must be maintained in the interim. Many pavement preservation techniques were developed for lower-volume roads, and agencies are reluctant to apply these methods to roads like SR-85.

The SHRP 2 reports, *Preservation Approaches for High Traffic Volume Roadways*⁷ and *Guidelines for the Preservation of High-Traffic-Volume Roadways*,⁸ describe preservation treatments and strategies for higher-volume roads. These strategies can extend the service life of older pavements. If the wait for reconstruction will be long, an agency could opt for an alternative pavement rehabilitation project using strategies discussed in the SHRP 2 report, *Using the Existing Pavement In-Place and Achieving Long Life*.⁹

Strategic Payback

This exercise includes products from each of the four

⁵ www.trb.org/Main/Blurbs/168046.aspx.

⁶ www.trb.org/Railroads/Blurbs/164283.aspx.

⁷ www.trb.org/Main/Blurbs/165280.aspx.

⁸ www.trb.org/Main/Blurbs/164965.aspx.

⁹ www.trb.org/Main/Blurbs/168146.aspx.



PHOTO: TOM SOUTON

SHRP 2 research has explored highway preservation systems such as air-coupled ground-penetrating radar.

focus areas of SHRP 2 research and illustrates how these products, both singly and in combination, will successfully address all four strategic goals of the program. The products are designed for easy integration into transportation practice. Agencies can select from the array of SHRP 2 products to fit their needs and resources. More extensive selections will yield a bigger payback, but a smaller selection addressing crucial problems will have a significant impact also.

Other articles in this issue provide greater detail about the products of the SHRP 2 program. The program was designed to equip transportation agencies with the means to meet users' expectations of safe and reliable trips on roads planned, built, and operated to help communities thrive.

No set of examples can illustrate the depth and breadth of the full gamut of SHRP 2 products. To learn more, visit the SHRP 2 website¹⁰ and the SHRP2 Solutions website hosted by FHWA to support implementation.¹¹

Readers are invited to use the road from Old Town to New Town to delve deeper into SHRP 2. Review the product briefs and fact sheets on the web pages and locate application sites for the products on the sketch map. Additional suppositions can be made about the Old Town–New Town area—for example, both underground and overhead utilities are likely to be found in and around Old Town or New Town, and the SHRP 2 products related to public utilities would be applicable.

SHRP 2 researchers and staff would like to know how these exercises work out. Readers are invited to send the results to SHRP2@nas.edu.

¹⁰ www.TRB.org/SHRP2.

¹¹ www.fhwa.dot.gov/goSHRP2.