Improving Coordination with Utilities

Photo courtesy FHWA

UTILITY SOLUTIONS

Solving Utility Issues in Transportation Projects to Save Lives, Money, and Time

New Tools to Manage Your Utility Program

Telephone and internet cables; electric and gas lines; pipes, both large and small, all have to be considered when a transportation agency digs into the earth. Every time a shovel goes into the ground, a utility strike is possible – unless the agency and contractor know what's underground at a given location.

More than 35 million miles of underground utilities are known to exist in the United States but many more are not identified. As a result, agencies need every possible advantage to detect and manage utility conflicts and make wise decisions.

Because it's not just about saving money by reducing utility relocations. It's also about saving lives.

The second Strategic Highway Research Program (SHRP2) focused on developing better solutions that can be used by state departments of transportation (DOTs) and their counterparts to mitigate any potential negative effects on their programs.

They are:

- ***3D Utility Location Data Repository*** (R01A)
- ***Utility Locating Technologies*** (R01B)
- ***Identifying and Managing Utility Conflicts*** (R15B)

> *"Anticipating and resolving utility conflicts early in the process means fewer change orders, fewer construction delays, and less impact on the public. By using this SHRP2 product, you can have a snapshot at any time of the status of the cost and schedule of all utilities on the project. That can save us money, time, and risk."*

—Jesse Cooper,
Map, Survey, and Utility Section Director,
Texas Department of Transportation

SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

U.S. Department of Transportation
Federal Highway Administration

AASHTO

Photo courtesy Leif Skoogfors, FEMA

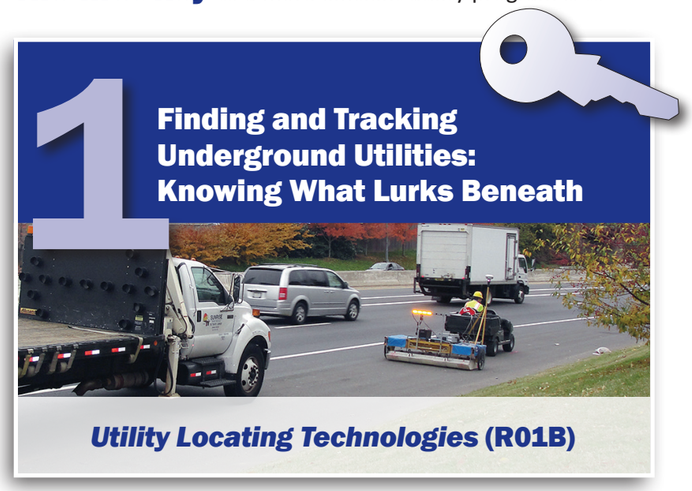
Three Keys to a Smarter Utility Program

Moving utilities out of the way may not always be the most cost-effective solution. It might be more efficient to protect the existing infrastructure or redesign the project. Even a slight alteration in design may be sufficient.

A suite of new tools from SHRP2 addresses the biggest challenges presented by underground utilities: how to more accurately locate utilities; how to manage potential conflicts to minimize delays and disruptions to the public; and how to ensure data is stored for current and future projects.

Each of these three SHRP2 Solutions can be used on its own, or can be bundled together to maximize their efficiencies. The products can be used in any order. The progression outlined below is just one approach to using these tools.

The first key to a more efficient utility program is to



know what's underground. The process usually begins with a visual survey, followed by a physical investigation. With more sophisticated detection, mapping, and database technologies, transportation agencies and utility companies can do a better job of tracking the location of most existing utilities. Given that many of these facilities were put in the ground 50 – 60 years ago, however, they are not always clearly identified or even marked on utility record drawings.

Photos courtesy District DOT, Oregon DOT

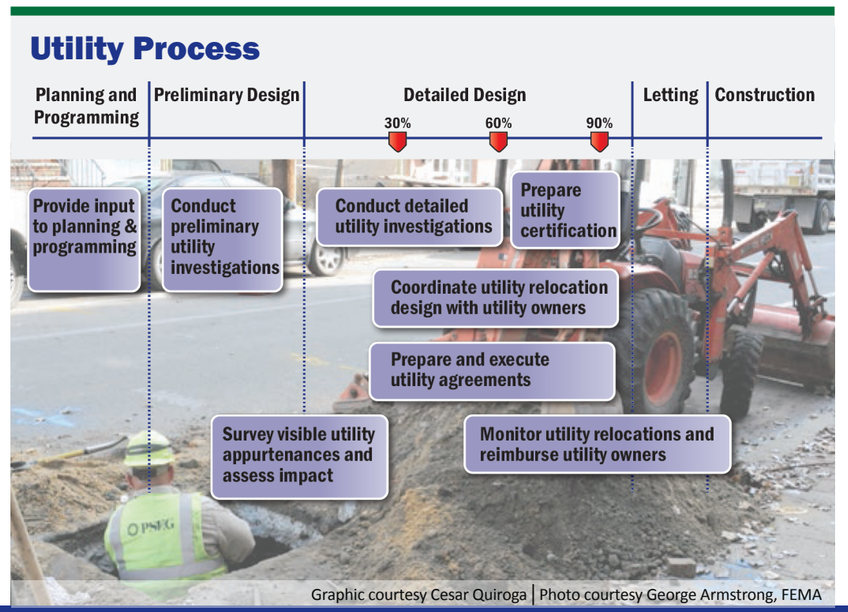
Knowing the location, depth, and important attributes of underground utilities enables more efficient and productive coordination with utility owners during the design process while minimizing overall utility conflicts.

Utility Locating Technologies (R01B) has identified multiple types of geophysical devices to detect, locate, and characterize subsurface utilities in conjunction with existing tools.

As a result, two advanced utility identification technologies will be evaluated in the field by transportation agencies in the coming months. The first is Multi-Channel Ground Penetrating Radar (MCGPR). MCGPR, however, does not work well in clay soils, so another technology has also been identified. Time Domain Electromagnetic Induction (TDEMI) can work in highly conductive soils, but cannot detect non-metallic utilities without a tracer wire.

Limitations in these technologies indicate that soil type, terrain, and other geophysical attributes will help determine which technologies are appropriate for a given location.

The best overall practice is to employ multiple types of geophysical technologies, deployed in multiple channel modes when possible.
Using digital geophysical mapping in conjunction with common pipe and cable



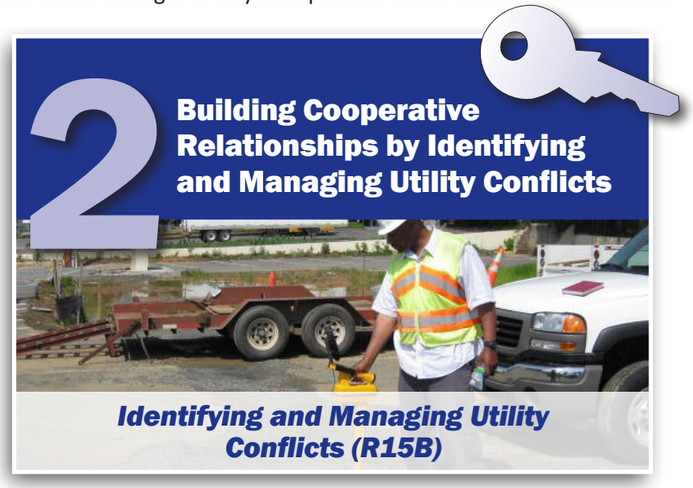
Graphic courtesy Cesar Quiroga | Photo courtesy George Armstrong, FEMA

locating tools enhances utility detection and data interpretation. This combined approach produces more complete mapping and supports a more targeted and less expensive test-hole program.

These advanced technologies have a great potential to provide significant benefits not just to the transportation agencies but also to the subsurface utility engineering (SUE) firms many of them hire to undertake this work.

States currently implementing this product are **Arkansas, California, Indiana, Montana, Ohio, Oregon,** and **Virginia**.

The second key is to identify any potential conflicts that might exist within the right of way for a planned construction or rehabilitation



project. Utility conflict management is an engineering process that includes coordination and data management, as well as the application of sound engineering principles to analyze and resolve utility conflicts effectively.

Identifying and resolving potential utility conflicts early in the design process can minimize delay and costs. The management of these conflicts through effective communication among stakeholders, therefore, is a critical mechanism to avoid these problems and keep transportation projects on schedule.

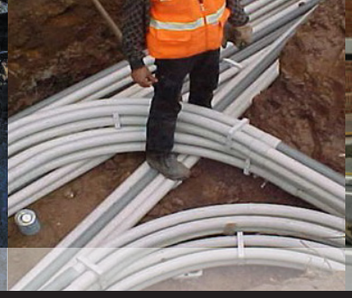
Another critical factor is the documentation and management of enormous amounts of data and supporting documents, including schematics, design files, agreements, and certifications.

The SHRP2 product, ***Identifying and Managing Utility Conflicts*** (R15B), can be used at every step in the utility process. The Utility Conflict Matrix (UCM) enables an agency to conduct a preliminary investigation, assess utility impacts, and then make a record of the activity or activities needed.

The tools and strategies include:

- Compact, stand-alone Utility Conflict Matrix (UCM);
- Utility conflict data model and database; and
- One-day training course to help agencies incorporate the UCM in existing business practices so that utility conflicts are identified throughout the design process. The training follows a step-by-step process using actual field examples from states across the country.

Photo courtesy FHWA



Photos courtesy Gas Technology Institute; Liz Roll, FEMA

Cost-estimating analysis, examples of database approaches being taken by several states, and hands-on exercises are included.

The stand-alone UCM, data model, and database are available on the TRB web site (**http://www.trb.org/main/blurbs/166731.aspx**) along with a companion research report featuring best practices from state departments of transportation, as well as case studies that identify prevailing issues and proven solutions.

States currently implementing this product are **Iowa, Kentucky, Michigan, Montana, New Hampshire, Oklahoma, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Vermont,** and **Washington**.

The third key is to store and easily retrieve underground utility location data. This provides numerous benefits in the field data collection, design, and construction areas of transportation projects. Designers can modify designs to accommodate extensive utility locations and contractors can avoid encountering unknown utilities in the field, preventing lengthy and costly modifications to projects.

3 Saving Information for Current and Future Projects

***3D Utility Location Data Repository* (R01A)**

The ***3D Utility Location Data Repository*** (R01A) was created as a storage and retrieval data model to accommodate large volumes of utility data. With it, agencies can develop reliable, accurate data on location and/or depth of utilities. It interfaces with existing design software and can be linked to existing systems and databases.

The stored data can include the horizontal and vertical location of the utilities, as well as attribute data that are needed to effectively coordinate with utility owners. The model also can provide updates on utility changes from one project to the next, reducing re-design work and cost.

Expected activities for implementation include using the 3D repository on a roadway design project, and developing guidelines and specifications to integrate the technology into an organization's business processes.

States currently implementing this product are **California, District of Columbia, Indiana, Kentucky, Michigan, Montana, Oklahoma, Oregon, Pennsylvania, Texas, Utah,** and **Washington**.

What Your Colleagues Are Saying

> *"If you don't identify utility conflicts on the front end of a project, the costs can be monumental – from a few thousand dollars for smaller projects to a few million dollars. The **SHRP2 Utility Conflict Matrix** enables utility subject matter experts to communicate with design subject matter experts in a forum that is standardized and understandable to both."*
>
> **—Jennifer McCleve,**
> Branch Manager for Utilities and Rail, Kentucky Transportation Cabinet

Learn More

Visit the Improving Coordination with Utilities web page to access case studies, presentations, research reports, and other helpful materials: **http://shrp2.transportation.org/Pages/UtilityRelatedProducts.aspx**.

Numerous training opportunities and webinars are being scheduled for these and other SHRP2 products. For information, contact: Ken Leuderalbert, FHWA, ***Ken.Leuderalbert@dot.gov***; Keith Platte, AASHTO, ***kplatte@aashto.org***; or Pam Hutton, AASHTO, ***phutton@aashto.org***.

For information about these and other SHRP2 products, go to: www.fhwa.dot.gov/GoSHRP2 or http://SHRP2.transportation.org