

Transportation for Communities

Advancing Projects through Partnerships

Case Study

UTAH I-15 NOW

Calculated Engineering and
Design-Build for
Rapid Delivery of
Improvements

SHRP 2
STRATEGIC HIGHWAY RESEARCH PROGRAM
Accelerating solutions for highway safety, renewal, reliability, and capacity

TRANSPORTATION RESEARCH BOARD
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The Transportation for Communities website provides a systematic approach for reaching collaborative decisions about adding highway capacity that enhance the environment, the economy, and the community and improve transportation. It identifies key decision points in four phases of transportation decision making: long-range transportation planning, corridor planning, programming, and environmental review and permitting.

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Calculated Engineering and Design-Build for Rapid Delivery of Improvements

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EXECUTIVE SUMMARY

The Utah Department of Transportation's (UDOT's) primary objective for the Interstate 15 New Ogden Weber (I-15 NOW) improvements was the fast and effective delivery of upgrades. The key challenges to rapid development were cost-effectiveness, accommodating multimodal transportation options, and minimizing disruption to traffic and adjacent rail operations.

The 9.3-mi project consisted of widening the segment of I-15 from 31st Street to 12th Street (in Ogden) from four to eight lanes and the segment from 12th Street to 2700 North (in Farr West) from four to six lanes. The metropolitan planning organization (MPO) considered aspects of the project as early as 1997, but other priorities, including planning for the Olympic Games, took precedence. By 2000 the state legislature was pressing an accelerated timetable for the I-15 NOW improvements because of the outdated roadway's numerous safety deficiencies along with notorious traffic congestion at the 31st Street interchange. Five railroad crossings, 22 bridges, and 5.5 interchanges presented the major engineering hurdles. Few environmental issues were raised during the National Environmental Policy Act (NEPA) process, which began in 2001. UDOT's challenge was to provide the best roadway improvements with the limited funding available.

Several distinctive elements facilitated design and engineering for the project. At the end of the NEPA process in 2004, UDOT decided to proceed with a design-build approach for delivery. Discussions between UDOT and the Federal Highway Administration (FHWA) led to an Accelerated Construction Technology Transfer (ACTT) workshop in 2005. The workshop brought together experts to examine potential project hurdles and solutions. Supplemental funding approval by the state legislature enabled the project to move forward and implement its full scope. The I-15 NOW project broke ground in spring 2006 and at the time of this writing is 65% complete.

Information collected during this case study's research was supported by interviews with multiple individuals from UDOT, Wasatch Front Regional Council (WFRC), Federal Highway Administration (FHWA), and consultant staff under the guidance of Michael Baker Jr., Inc. (Baker). Quotations within this document are drawn from these interviews without specific reference to the individuals.

BACKGROUND

First constructed in the late 1950s and early 1960s as part of the nationwide interstate highway system (1), I-15 is a major north-south roadway connecting California, Nevada, Utah, Idaho, and Montana. In addition to serving as a national transportation corridor, I-15 is the only major north-south road for high-speed travel within Utah (2).

When it was constructed, the section of I-15 in the project area was classified as a rural interstate. However, the growth of Ogden and nearby municipalities in the past decade has altered that status. The I-15 corridor runs north of Salt Lake City and serves as the major artery for commuters between Salt Lake City and communities to the north (see Figure 1). In the mid-1990s, Salt Lake City won its bid to host the 2002 Winter Olympic Games, bringing Utah worldwide media visibility and an economic influx. The Olympic Games posed a challenge to state leaders because I-15 required major improvements to showcase the best of Utah for a worldwide audience. These improvements required much up-front planning and significant investment in infrastructure improvements.

Project Overview

The I-15 NOW improvements project is widening and improving 9.3 mi of highway passing through the cities of Ogden, West Haven, Marriott-Slaterville, Farr West, and some unincorporated parts of Weber County (2). The project will widen I-15 from four to eight lanes between the southern terminus at 31st Street in Ogden and the 12th Street interchange. Additionally, the interstate is being widened from four to six lanes from 12th Street to the northern terminus at 2700 North in the town of Farr West. The project corridor includes the main line of I-15 and the connection of east-west arterial roads at five full interchanges and one half interchange. UDOT also must consider five railroad crossings and plans for commuter rail. The reconstruction is one of the largest projects UDOT has ever undertaken (3).

The city of Ogden was a central link in the westward expansion of the United States in the nineteenth century. Ogden was a main terminal for the transcontinental rail line and continued to be a

major railroad town from the 1870s through World War II. The Golden Spike National Monument, where east and west railroads were linked, is about 40 miles northwest of Ogden. The city occupies a linear region 15 miles wide at its widest point, with the Wasatch Front mountain range to the east and salt flats and the Great Salt Lake to the west. Ogden's transportation system is focused on the north-south movement of goods and people. UDOT's plan for the I-15 NOW project, to widen and replace main-line and ramp pavements, also includes

- Replacement of 18 bridges;
- Rehabilitation of four bridges;
- Construction of two new bridges;
- Addition of noise walls throughout the project area; and
- Incorporation of elements of UDOT's intelligent transportation systems (ITS), such as traffic cameras, electronic message boards, and pavement sensors.

Project Drivers

The need for additional road capacity in Weber County and an upgraded, safer roadway were the driving factors for this project. Rail lines into Ogden make I-15 the central arterial roadway for ground shipping in the region, adding to traffic volume. This interstate provides central access to Hill Air Force Base, which is located south of the I-15 NOW project area and is the largest single employer in the state. I-15 also links to the city's airport. The classification of I-15 through Weber County will likely be upgraded to urban interstate.

Traffic congestion on I-15 is a function of high traffic volume on an outdated roadway, and reconstruction is necessary to bring the corridor up to current design standards and increase safety. Major issues with I-15 included the following:

- Pavement was at the end of its service life;
- Bridges did not meet current seismic design criteria;
- Vertical and lateral clearances on I-15 and the Union Pacific Railroad (UPRR) were insufficient;
- Seven structures associated with the project were considered structurally deficient or functionally obsolete;

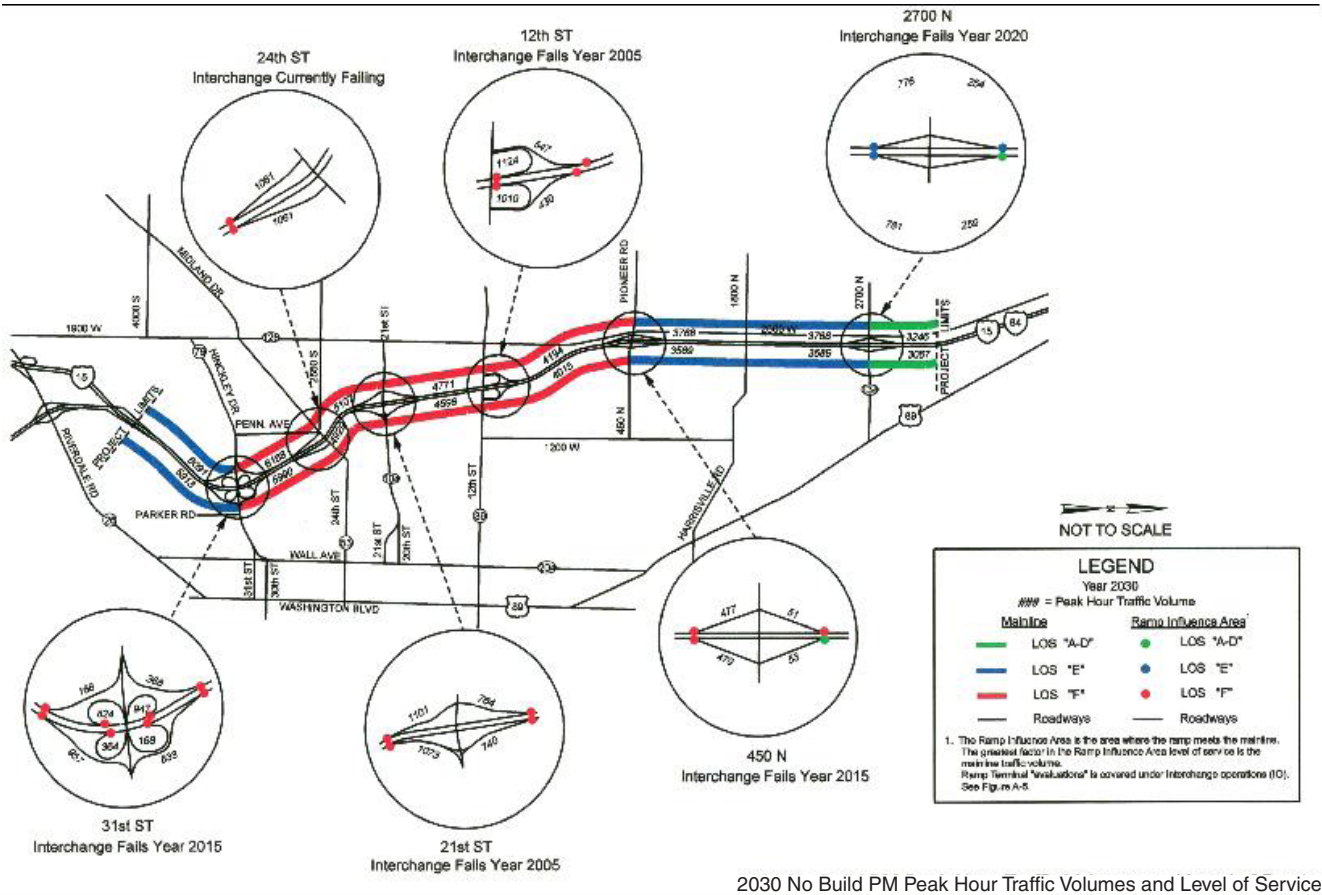


Figure 2. LOS for segments of I-15 and intersections (2).

Utah, and Montana, aims to develop a continuous roadway from Mexico through the United States into Canada as part of an effort to establish a safe and efficient trade and transportation corridor that will accelerate job growth and tourism. STRAHNET is a network of highways that are important to the strategic defense policy of the United States and that provide defense access, continuity, and emergency capabilities for defense purposes. The state legislature is pressing for completion of the project.

Initial Concept and Planning

The Centennial Highway Fund

In 1997, the Utah state legislature created the Centennial Highway Fund (CHF) to finance major highway needs throughout the state. Created from an increase in state gasoline taxes and other fees, the

CHF became a \$2.5 to \$2.6 billion program over 10 years. The fund was to be used for transportation expansion projects that were not funded by the transportation fund. The CHF initially helped fund transportation improvements associated with the 2002 Winter Olympics in Salt Lake City. It was also used to support infrastructure spending around the state. The I-15 NOW project used CHF funding, and so in that regard the project came about as a result of planning for the Olympics.

Forty-three specific projects were identified to receive portions of the CHF, the most prominent of which was the I-15 reconstruction in Salt Lake County, a 16-mi design-build segment through Salt Lake City. Construction started in 1997 and was under a strict time constraint to be completed before the Winter Olympics. Ultimately, reconstruction of the Salt Lake segment of I-15 cost \$1.59 billion,

and it was completed in May 2001. To manage the impacts of this rapid megaproject, Utah hired a public relations firm. The state's quick organization, funding, and design-build delivery process made the reconstruction a success. The project, however, highlighted the need for improvements elsewhere in Utah. Other municipalities wanted to see a balanced spending of state funds. A member of WFRC noted that "[CHF] was for I-15 in Salt Lake County, but it had a put-aside for Weber County."

Although the CHF provided funding, the I-15 NOW project was prompted by traffic-volume problems and safety needs. "The initial scope," said a member of UDOT of I-15 NOW, "was defined through the Centennial Highway Fund—to address needs that the legislature had identified around the time of the Olympics, and to push for equal funds throughout the state, not just in Salt Lake City."

Inter-Regional Corridor Alternatives Analysis

In October 1999, a large study was initiated to look broadly at transportation issues and solutions across urbanized parts of Utah. Some segments of I-15 needed rapid reconstruction before the Olympic Games, but the region had a larger range of transportation issues that would require solutions beyond the Olympics. Many NEPA or major investment studies (MISs) focusing on specific corridors or modes of transportation had been conducted, but the region was growing rapidly and the transportation issues extended beyond individual MPO planning boundaries.

The MPOs and the implementing agencies, the Utah Transit Authority (UTA) and UDOT, recognized the need to combine their planning efforts into a coordinated, long-range assessment of interregional transportation needs. Four sponsoring agencies—WFRC, the Mountainland Association of Governments (MAG), UTA, and UDOT—designed the Inter-Regional Corridor Alternatives Analysis (IRCAA) study to evaluate Utah's transportation needs and develop an effective approach to solving those needs. The IRCAA served primarily as an alternatives analysis to provide an opportunity for decision making on transportation investments, with a focus on inter-regional commutes (4). The study area was a 120-mi north-south corridor passing through 50 cities and

towns across five counties and encompassing most of Utah's urbanized areas. The corridor extended from Brigham City at the north end to Payson at the south and from the Great Salt Lake eastward to the Wasatch Mountains. The study's purpose was to examine a mix of multimodal solutions that would best work together to address transportation needs for 30 years. The study examined roadway MISs as well as transit and other studies, which included the Long-Range Transit Analysis for the Wasatch Front: Intercity Transit Analysis (1996), the Regional Commuter Rail Feasibility Study, the South Salt Lake County Transit Corridors Analysis, the West Valley City Transportation Corridor Major Investment Study, the I-15 Corridor Study (1991), and the Western Transportation Corridor MIS (1998), as well as information from several studies that were under way, including the second Western Transportation Corridor Study and the North Valley Connectors Study (2001).

The IRCAA study devoted considerable research to rail alternatives, such as monorail, light rail, and diesel. It also considered an "enhanced roadway" alternative, which examined road capacities relative to broad mobility patterns. The study focused primarily on population and employment densities relative to travel patterns and demand. The study planners encouraged public involvement and received input from FHWA, the Federal Transit Administration, and the Federal Railroads Administration. This was not a NEPA study and, as such, did not consider environmental resources in depth or involve resource agencies. The results of the study were a locally preferred alternative that combined commuter rail, expanded bus services, some highway widening, ITS, and travel demand management (TDM). The IRCAA report identified many areas of I-15 for improvements. The report also recommended constructing completely new roads and widening to six lanes the Weber County segment of I-15 from 31st Street in Ogden north to 2700 North.

The Olympics were a catalyst to funding, but the initial I-15 NOW project planning and development phases were described as about the same as most other projects. The project scope and construction schedule evolved as funding fluctuated. It

was not until the end of the NEPA process that the project became unique, being put on a fast track for design and delivery. A UDOT member explained, “The legislature and UDOT leaders pushed the fast time line. The legislature pushed projects that they identified as critical needs.” With this emphasis on project acceleration, UDOT sought creative solutions to rapidly complete the project and still get maximum value.

MAJOR PROJECT ISSUES

UDOT experienced few issues with the I-15 NOW project development. The project consisted primarily of widening the existing interstate with most of the widening encroaching on the median. There were a handful of historic properties, a very low proportion of wetlands, and limited wildlife or habitat issues. The biggest potential impacts were to the local communities, but the public agreed with the need for improvements and the project had the support of local politicians. A telephone survey of 613 Weber County households with drivers using I-15 at least twice a month revealed that 90% supported the project. Thus, the development process was reduced to a balance of design and budget.

The scope of the project was linked to funding, which varied somewhat during the development stage. The initial budget was \$180 million, which was based on the amount of CHF funding available. It became clear during the planning process that the desired range of improvements would not be achieved at that cost. The project needed contingencies that considered both levels of construction and levels of funding. UDOT planners considered options such as finding more funding, eliminating some improvements, and staging the project for a phased delivery.

Interchanges played a major part in the project, with two in particular presenting challenges to project development:

- The 31st Street interchange crosses a landfill that had shown a considerable amount of settling. The landfill composition was unclear, making design and costs in that area difficult to calculate.

- The 24th Street interchange presented significant challenges. The interchange was originally a half-diamond configuration, in which drivers can exit north and enter southbound, but not the other way around. The interchange was originally constructed this way because of two rail lines on the north side of the interchange. Downtown Ogden businesses contended that a full-diamond interchange would improve access to and from the highway and enhance business. However, the presence of the rail lines meant that any work to modify the interchange into a full diamond would be difficult and expensive, and the modification was not in the initial scope or budget. Furthermore, the neighborhood around the 24th Street interchange was predominantly Hispanic and low income, resulting in environmental justice issues that UDOT did not anticipate during original budgeting and planning.

INSTITUTIONAL FRAMEWORK FOR DECISION MAKING

Transportation planning in Utah is considered to be top down because most highway funding priorities, as well as the need for improvements, are decided by elected officials in the state legislature (5). First, the legislature identifies a need. Second, MPOs include the identified need in their transportation improvement plans (TIPs) and perform an air quality conformity analysis. Finally, UDOT begins to schedule the improvement. The consensus among the interviewees for this case study was that the I-15 NOW project was initiated because the legislature designated it as critical for funding.

In 1997, the WFRC TDM recognized that the congestion issues in the area of the 31st Street interchange required a rapid solution, suggesting potential inclusion in its long-range plan (LRP). The legislature saw the need for the project and pushed it into the planning process. About half of the current project, to widen I-15 to six lanes from 31st Street to 12th Street, was added to the LRP. Funding would come from the CHF, a state fund administered by UDOT, but strongly directed by the legislature.

The I-15 NOW project is in UDOT Region 1. UDOT hired the engineering firm Michael Baker Jr., Inc., to conduct the necessary project studies and address NEPA compliance. FHWA and UDOT began the environmental impact statement (EIS) as a cooperative process in April 2001 (2). WFRC included the project in its 2030 LRP (December 2001) and its 2002–2006 TIP, and UDOT included the project in the 2003–2007 State Transportation Improvement Plan (STIP). The Baker project team estimated Phase I improvements to cost from \$171 million to \$177 million. The NEPA process included development of steering and advisory committees, which were involved in the development of alternatives and were a principal step in screening the alternatives. The first steering committee meeting in May 2001 helped the project team confirm the project termini and the necessary study area, improve on the purpose and need, and understand some of the potential issues that stakeholders might raise. At their second meeting, the steering committee recommended concept layouts that should advance for further consideration and screening. In June 2002, at the third steering committee meeting, members ranked elements of the concept layouts and the purpose and need in order of relative importance. The project development team assembled the draft EIS with the consideration of alternatives and options.

UDOT put the project on its 2003–2007 STIP for concept development, and the EIS was completed in August 2004. In 2005, the legislature approved spending \$180 million from the CHF for the project. The initial plan was to complete the roadway in phases, as funding became available. The EIS estimated the cost for the project's full preferred scope at \$235 million. To help the project move forward quickly and efficiently, it was contracted as a design-build process to Weber County Constructors, a joint venture of Granite Construction Company and Ralph L. Wadsworth Construction Company. Michael Baker Jr., Inc., provided the engineering expertise, and Weber County Constructors assumed the permitting responsibilities. In 2006, WFRC approved a one-time appropriation of \$51 million to enable UDOT to collapse the project phases and finish the entire job quickly.

TRANSPORTATION DECISION-MAKING PROCESS AND KEY DECISIONS

The planning and NEPA processes for I-15 NOW were essentially consecutive. Initially, it appeared that the project could be funded with the CHF money alone. WFRC was one of the sponsors of the IRCAA study and knew the study recommendations. The EIS for the I-15 NOW project began in April 2001, as the IRCAA study panel was finalizing its conclusions. The initial scope from the legislature focused on the 31st Street interchange, planning to widen the roadway to six lanes from that interchange up to 12th Street. The IRCAA study recommended the improvements be extended north to 2700 North. The recommended improvements would add two general-purpose lanes to the already existing lanes.

Conditions Analysis

In April 2001, FHWA published a notice of intent to conduct an EIS and sent letters to potential cooperating agencies. UDOT's consultant prepared a conditions analysis and an EIS for potential expansion. The initial phase of this \$2.8 million contract called for evaluation of existing conditions and development of engineering solutions to solve existing traffic and infrastructure deficiencies along the I-15 corridor. The focus was largely engineering and examined multimodal traffic modeling. The modeling was structured to evaluate the needs of a reconstruction project as well as a range of potential solutions. This phase of the project examined the targeted section of I-15 more closely. As a component of the work, Baker would also conduct the NEPA study to assess associated environmental impacts. No environmental agency chose to formally participate in the NEPA process as a cooperating agency, but the U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Department of Agriculture, and U.S. Department of the Interior provided written correspondence and/or participated on the project's steering and advisory committees.

Baker facilitated the conditions analysis through a series of technical memos with analyses following the 1987 FHWA Technical Advisory T 6640 8A (6–8). The studies noted many technical deficiencies: the bridges did not meet UDOT or American Association of State Highway and Transportation Officials (AASHTO) seismic standards, the pavement was at the end of its service life, and vertical curves did not meet current standards for stopping distance or sight distance. The studies also examined UDOT crash data from the project area. UDOT incorporated information from the technical memos into the NEPA study by reference. The technical memos represented a means of providing sufficient easily understood information without being overly technical.

The Legacy Parkway Project Lawsuits

UDOT proposed the Legacy Highway as a 120-mi, four-lane, limited-access highway paralleling I-15 just west of the project area (9). The project was to be a completely new alignment designed to bypass the urbanized areas of Ogden and Salt Lake City. The first segment, called the Legacy Parkway, generated considerable public opposition, including a Stop Legacy Highway website, which has since been taken down. Much of the resistance was based on the Legacy Parkway’s environmental analysis. The final EIS for the first 14-mi segment was seen as deficient, resulting in a lawsuit. Completed in 2000, the final EIS found that the preferred alternative would affect 114 acres of wetlands and 699 acres of wildlife habitat, and it was located partially within the 100-year floodplain of the Great Salt Lake. Some of the wetland impact and hydrogeology computer modeling was thought to be flawed (10). In November 2001, a court issued a temporary stop-work injunction.

The controversy surrounding the Legacy Highway put other highway projects at the time on alert, especially improvements to I-15. The final EIS for the Legacy Parkway project claimed that the highway was a connected action to I-15 improvements. It contended that I-15 capacity projects would not be necessary if the Legacy Parkway project was built (11). This was not the case, at least not for all segments of I-15. Jones & Stokes (now ICF International) completed a supplemental EIS (12) for

the Legacy Parkway project in 2005 and addressed the Record of Decision (ROD) issues in 2006. The Legacy Parkway supplemental EIS developed much of the purpose and need for the Legacy Parkway project in relation to I-15. In particular, it stressed the need to provide an alternative north-south route besides I-15. The supplemental EIS cited the STRAHNET role, emphasizing that an alternative to I-15 would provide emergency transportation routes for military personnel and equipment between Department of Defense locations during peace and war (12). It also cited right-of-way (ROW) constraints on I-15 that could limit its growth, and devoted a section to shared solution projects, which examines the combined effects of commuter rail, I-15 improvements, and the Legacy Parkway.

The section of the Legacy Parkway project that generated controversy is well south of the I-15 NOW project (13, 14). Impacts of the Legacy Parkway on the I-15 NOW development were indirect. Nevertheless, it served as a cautionary reminder for the I-15 NOW project team to ensure the best possible project development process.

The NEPA Process

Widening and modernization were project goals from the planning phase. The steering and advisory committees developed the specific viable alternatives during the NEPA process. Baker’s traffic studies found that meeting the design-year traffic demands would require the southern section of I-15 to be increased by two general-purpose lanes in each direction, for a total of eight lanes from 31st Street to 12th Street. The EIS process included a no-build alternative in addition to main-line solutions. Initially, there were 18 alternatives, but only six progressed to the EIS. The study also looked at transportation system management (TSM), TDM, and transit; these were ultimately combined into a single congestion management strategy. Other solutions included congestion pricing, toll collection, and land use alternatives. None of these other solutions progressed to the EIS as viable alternatives for meeting the purpose and need.

As part of the NEPA process, UDOT and FHWA established a steering committee and an advisory committee. The steering committee consisted of

representatives from UDOT, FHWA, WFRC, USACE, and the local municipalities of Marriott-Slaterville, Ogden City, Roy, West Haven, and Weber County. UPRR and the towns of Farr West, Harrisville, and Riverdale were also offered the opportunity to participate on the committee. Each community in which improvements were proposed had specific need and funding concerns. The steering committee was the forum to communicate these needs, concerns, and opinions.

One goal of the CHF was to distribute infrastructure funds to towns other than Salt Lake City. For the I-15 NOW project, each municipality wanted community-specific improvements. With a tight budget, and the idea of phasing-in the improvements, the disbursement amounts and timing were uncertain. Consequently, steering committee members had their own interests foremost in mind. The committee forum was the place to discuss project interests and goals, and it effectively mediated potential conflicts among the different groups. The committee ranked the project's purpose and need by relative importance in order to evaluate the alternatives as a group. The steering committee is remembered by several interviewees as being an integral project development tool. However, the members' involvement was not necessarily extensive.

The advisory committee consisted of the steering committee and a variety of community stakeholders. These stakeholders included representatives from local citizen groups, business communities, schools, and neighborhoods (2). The project team used the first project newsletter, the steering committee, and information from the first open house to identify interested stakeholders for this committee. The advisory committee was the primary forum for stakeholder input. The committee broke into sub-committees to review design details, costs, impacts, and benefits of the alternatives.

The bottleneck at 31st Street had always been the most congested location along the roadway. Local elected officials recognized the problem as early as 1997, and the speaker of the Utah House of Representatives supported the project. There was concern at the MPO that the project was too big. UDOT divided the project into phases, but the speaker

wanted it all completed in one phase and indicated he would find funding. "So, [WFRC] combined it into one phase," noted a member of WFRC, "but, [the speaker] wasn't [in office] 2 years later, and the costs had risen." Nevertheless, most of the committee members and stakeholders concluded that constructing one project from 31st Street to 2700 North was the best use of available funding.

The solution screening process was a refinement of options at several detail levels. Solutions were initially identified at a descriptive level, subsequently refined to a schematic and conceptual level, and finally to a preliminary engineering level (2). Concept designs were developed according to UDOT and AASHTO standards (8). UDOT considered a no-build alternative and a base-build alternative in the draft EIS. Additional alternatives included main-line and interchange options with variations of main-line improvements and interchange types. A UDOT member explained, "We did technical work, but presented it all to [the committees]. At the end of the day, they felt more educated and when they made comments, they were educated comments. They felt like they had input in the decision. We didn't hand the decision over to them; we weighed their opinions."

Among the challenges to be addressed were five railroad corridor crossings, some heavily traveled with as many as 300 trains a day. One went over the project area, and the other four went under the project area. The five corridors are owned or operated by UPRR, UTA, and Utah Central Railway Company, which have different purposes and needs. Additionally, UTA was granted approval to proceed with construction of a commuter rail between Ogden and Salt Lake City. UTA started coordination with the railroad, mainly to preserve corridors and easements. As the NEPA process for the I-15 NOW project got under way, UTA was also conducting a NEPA study of possible commuter rail from Ogden to Provo. The new commuter rail would cross under I-15 north of the 31st Street interchange along an existing rail corridor for access to a proposed station at the Ogden Intermodal Center on Wall Avenue. The I-15 NOW project took advantage of the ongoing rail negotiations when UDOT established preliminary master agreements with the railroads

during the planning and NEPA phase of the project. Construction schedules had to take into account the rail operating schedules and UTA's planned commuter rail construction. A UDOT member recalled, "We knew it would be a hot item going into it."

The I-15 project development team reviewed the following data sources:

- Relevant town plans;
- Weber County online tax parcel data (Geo Gizmo) for land use impact assessments;
- The WFRC 2001 Travel Demand Model for statistics on projected socioeconomic growth;
- The Weber County Development Corporation (plan) and Ogden City General Plan to ensure consistency among the project and cities' goals; and
- The Wasatch Front Regional Multiple Listing Services (MLS for real estate) to calculate the housing values and relocation costs for residents displaced by the project.

Public outreach and involvement consisted of a standard combination of three public open houses, three focus workshops, several city council meetings, a postcard mailing, and four newsletter mailings. The initial public meeting in July 2001 was a scoping meeting attended by 25 to 30 people. Project team members attended West Ogden neighborhood meetings at the invitation of the local councilman.

WFRC provided the travel-demand model. Fehr and Peers Associates, Inc., prepared the socioeconomic growth projections to 2030 using a TDM adapted from WFRC's 2001 TDM. The MPO predicted future traffic demands using TP+ and Cube Voyager software, looking primarily at lane widths. The speed limit in urban areas is 65 mph, increasing to 70–75 mph outside of urban areas.

The 24th Street area represented the greatest uncertainty in planning and budgeting. At this half-diamond interchange, drivers could exit north from 24th Street and enter southbound, but not the other way around. The presence of the Union Pacific freight lines complicated designs at 24th Street, and UDOT found that all of the design options would result in significant environmental impacts. Full interchanges were located within 1 mi in each direction, and traffic capacity models did not indicate a need

for a full interchange. "But," said a UDOT member, "it was a hot item for downtown businesses because other interchanges were tied up—one of them couldn't have more development around it and the other was in another city. They wanted the economic benefits for Ogden."

The initial CHF \$180 million threshold budget was taken into account when screening and examining alternatives (2). The EIS estimated the total cost of the preferred alternative at \$235 million. It also assumed a multiphase project, with phases being completed as funding became available. In September 2002, the UDOT project manager appeared before the Ogden area transportation technical advisory committee. He reported that the project was under funding constraints, and priorities would be based on assessed needs. In other words, Ogden might not get everything the city wanted from the I-15 NOW project.

Environmental Assessment

There were no major environmental issues in the project development. Approximately 96% of the planned improvements were within existing ROWs. Resource agency involvement was minimal, described by a UDOT member as "a soft involvement. UDOT doesn't have a formal merger process." Removing existing bridge piers for three bridges over the Weber River would temporarily affect fish species and habitat, but the new bridges would be free spans, resulting in less intrusion into the waterway (see Figure 3). Six potentially affected historic sites in the area were determined to be eligible for listing on the National Register of Historic Places. All were linear canals or railroads and would not be affected under Section 106 because construction would pass over them. The preferred alternative did include a Section 4(f) use, permanently incorporating land from three archaeological sites, one historic residence, and one recreation facility. The sites and residence were fully documented and recorded before construction.

The preferred alternative affected only five of the potential 20 hazardous waste/material sites identified in the build alternatives, four of which were underground storage tanks. Only one of the sites presented an issue for design and construction: a landfill



Figure 3. Setting bridge girders over the Weber River.

with unknown deposits within the existing ROW near the 31st Street interchange. UDOT conducted additional geotechnical evaluations around the interchange as part of the final design process. These evaluations included borings to ascertain factors that could affect foundation design, such as corrosion potential, liquefaction within fills, and lateral spread potential. UDOT explained, “There are 15 feet of settling at 31st Street from the landfill, but you also have the river right there,” as well as the railroad. AMEC Earth and Environmental conducted a geotechnical study of the loading capacity and landfill material composition.

The project development team collected original data for the NEPA study in some cases and used database information in others. Although there were

geographic information system layers available, this did not include wetlands. A member of the Baker consulting team explained, “We used a lot of aerial imagery. We could do field work pretty freely, because we knew where the corridor was going to be.” The project development process was typical, if not easier than most. There were no formalized collaborations, but early involvement of some agencies helped the NEPA process progress smoothly. The Baker team said, “Historically we would have had a lot of 4(f) impacts, but we eliminated a lot of those issues. Most of the collaboration was with the UDOT archaeologists; they worked with the SHPO along the way.” The archaeologists worked to define site boundaries and resources near the roadway, enabling UDOT to avoid most of these resources. The NEPA

process required full wetland delineations, which indicated that impacts would be minimal. Instead of mitigation for wetlands, the project made an “in-lieu-fee” payment on behalf of USACE to a sponsor. This is a common solution when environmental impacts are minimal, and the in-lieu-fee approach to mitigation helps direct investments in wetland conservation and restoration to the greatest environmental needs within a watershed.

As the NEPA process progressed, the project team saw the benefit to increasing public involvement. The build alternatives would have the greatest community impacts at the interchange locations for 24th Street and 2700 North. Each area had different issues, with the 24th Street interchange potentially becoming contentious because of its proximity to the 21st Street interchange, which would cause any design changes at one location to affect the other. There was a railroad crossing, and any changes to the intersection would be extremely costly. The steering and advisory committees debated whether or not to upgrade the interchange from a half diamond to a whole diamond. Although the City of Ogden wanted the upgrade, the cost would seriously affect the project. As the debates over the 24th Street interchange heated up, the project team foresaw potential environmental justice, or EJ, issues with the location. The project team wanted to ensure adequate community outreach for all possible alternatives. UDOT was being sued for another project, and the I-15 NOW team wanted to prevent any similar controversy on their project. To avoid any debate with the NEPA document, the project team held workshops for the 24th Street and 2700 North interchanges, which included focus groups specifically on the EJ issues. This helped mitigate these issues later.

To publicize the workshops, project members hand delivered bilingual (English and Spanish) flyers to businesses and residences in potentially affected areas near the 21st and 24th Street interchanges. A Baker team consultant said, “We also considered the information that we had already obtained through census data, our project committee members who represented those areas, and comments we received from our scoping meetings. We had been working with an Ogden City representative who served the

West Ogden neighborhood located at the 24th Street interchange and through him we identified a representative over at the food bank, located within that neighborhood, where we held the focus workshops.” All attendees received a data sheet containing questions about travel patterns and community concerns. The attendees were asked to indicate their place of residence and respond to the following prompts and questions:

- Please describe your neighborhood.
- What do you like or not like about your neighborhood?
- What community or public facilities or recreation resources serve your neighborhood?
- What safety concerns do you have for your neighborhood, existing concerns, or anticipated concerns as a result of the proposed project?
- Please describe how you typically travel to get to work and/or school.
- Please describe how you typically travel to get to other regular activities.
- Will your travel plans to work, school, and other regular activities be affected by the proposed alternatives? If so, how?
- What transportation improvements would help enhance economic viability of your community?

Each data sheet had a numbered Post-it flag attached, and stakeholders adhered the Post-it notes onto a map of the project area indicating their area of interest. This enabled the group organizers and participants to quickly visualize where workshop attendees and their concerns were focused. The workshop began by describing the environmental process and presented the interchange alternatives. Smaller breakout groups were formed, on the basis of location, to discuss specific issues important to specific locations.

A Baker team member explained, “We didn't exclude the general public from these meetings, but our invitations clearly noted that the focus of the meeting would be these areas and that comments about other areas and issues could be addressed as part of a general public open house.” This focus workshop was successful, and the consultations helped later. The project team held a similar focus

workshop for the 2700 North interchange, but interviewees did not cite that workshop as central to the project development process. In interviews for this case study, project personnel described the workshops as “additional.” The workshops caused no delays and the EIS describes them as a standard part of the project development process.

On December 2, 2003, to announce the EIS, the project development team held a public hearing that was attended by 202 people. The ROD was signed in October 2004. With the EIS complete, it was still unclear how the funding would develop. In 2004, Utah Senate Bill 248—the Highway Project Bonding—set the spending limit at \$48 million, down from \$109 million the previous year. This funding cut delayed eight projects statewide, including the I-15 NOW improvements.

The Design-Build Process

As the NEPA process was wrapping up, UDOT officials made the decision to use the design-build approach. The project manager from UDOT was experienced in the design-build approach, having previously worked on the large design-build of I-15 in Salt Lake City. The legislature wanted I-15 NOW done quickly and efficiently to get the most roadway for its value. For this project, UDOT explained, “there were not a lot of ROW issues or utility relocations so we thought design-build was a good option.” The project was passed to the design-build firm just before permitting.

“The design-build firm was brought in at the end of the NEPA process,” said a UDOT member. “We had a draft and were about to put out the ROD. We did maybe 10% design for the NEPA process. We adjusted the NEPA documents to give the contractors—the design-builders—more options, more flexibility in cost savings.” Because it was brought in at the end, the design-build firm did not have a decision-making role during project development.

The design-build firm played a key role in permitting for the project and assumed the primary responsibility for dealing with the railroads. UDOT noted, “We had a preliminary master agreement with the railroads. Once we brought on the design-build

firm we finalized the agreements.” Rail companies require extensive coordination, licensing, and approvals for work around their facilities. The coordination was written up as Part 6B of the design-build contract. As described by a member of UDOT, the final cooperative agreements between UDOT and each railroad stipulated that the design-builder “will coordinate, design, and construct both temporary and permanent structures in accordance with the Railroad Companies’ criteria, as necessary to maintain level of service and to accommodate the Project construction. The Design-Builder is responsible to obtain and comply with all applicable design and construction specifications and requirements for each location.” In addition to the master agreement, there was a subagreement between UTA and UPRR for the reconstructions at 31st Street, because UTA planned to add a commuter line at that location.

Accelerated Construction Technology Transfer Workshop

As UDOT prepared to implement the decisions identified in the ROD through the design-build firm, several key decisions on interchange design and traffic management remained undecided. Additionally, UDOT faced a \$250 million cost estimate, a \$180 million budget, and a mandate to complete the project in 2 years.

With these facts in hand, UDOT and FHWA collaborated to host an Accelerated Construction Technology Transfer (ACTT) workshop for the I-15 NOW project. ACTT workshops are designed to bring together state highway agency staff and national experts to accelerate highway design. The experts identify innovative approaches to reducing time, costs, and congestion for projects while improving safety, quality, and roadway performance (15, 16). FHWA and UDOT identified eight skill-set teams for the UDOT ACTT workshop:

- Geotechnical;
- Structures;
- Right-of-way, utilities, railroad coordination;
- Innovative contracting;
- Traffic/ITS/safety;
- Construction;

- Roadway and geometric design; and
- Public involvement/public relations.

The ACTT design workshop identified several issues prompting a reassessment of project goals and options before the project proceeded. Key areas of concern were interchange design, funding availability, the goal of maintaining two lanes of traffic in each direction for the duration of the project, and the sensitive landfill area at the 31st Street interchange. The workshop recommended the order of improvements, suggesting critical elements and elements important to the public to be addressed first. It also provided valuable insights into various processes, such as

- Interfacing geotechnical concerns of the 31st Street landfill with the design-build process;
- Using frontage roads that fit within the ROW;
- Recognizing the complexity of coordination with the railroads; and
- Designing an effective contract with the right incentives for project delivery, procurement, subcontracting, and other goals.

The workshop also considered roadway design elements, traffic management during construction, and public relations using media collaboration and marketing.

Current Status of I-15 NOW Project

UDOT began major construction on I-15 NOW in spring 2006. At the time of this writing, the UDOT project manager estimated that the project was 65% complete; project completion was slated for September 2008.

LESSONS LEARNED

The widening and reconstruction of I-15 through Weber County is first and foremost an engineering success. The processes of creative and intensive design and a contracting structure for design-build delivery of the roadway improved efficiency and are allowing maximum improvements at the least cost.

Success Factors

Good Transportation Planning and Organization

The successes of the I-15 NOW project stem from Utah's effective planning system. The area appears to have a group of MPOs that work well with each other and with UDOT, FHWA, and other agencies. Historically, transportation needs are identified through a series of transportation studies in specific corridors as well as through the long-range planning efforts of the MPOs—WFRC and MAG. Since the late 1990s, the groups have focused on comprehensive interregional planning, a collaboration probably resulting from the Olympics. The major concepts for the I-15 NOW project, as well as the majority of the funding through the CHF, were the result of these supracounty planning phases.

The report *Wasatch Choices 2040: A Four County Land Use and Transportation Vision* is a multiregional LRP describing a community-based transportation planning process focused on smart growth (17). The plan's participants include WFRC, MAG, UDOT, Envision Utah, and UTA. Some of this cooperation is legislated by the state. The Transportation Planning Amendments of 2004, House Bill 23, codifies MPOs in state law and requires WFRC and MAG to coordinate their plans. The I-15 NOW project is an example of how well this plan can work. A WFRC member said, "There are four MPOs in the state, so we are small. [WFRC] is here where the state DOT contact is, so we have direct interaction. We try to meet with planning and programs once a month and the region directors a couple times a year in order to make sure we understand their priorities and what they are hearing as needs."

"For the last 12 years," the WFRC member explained, "we have been working more and more with Provo and putting together models—Provo, Ogden, and Salt Lake—working together quite a bit." This kind of interregional planning takes a comprehensive look at transportation issues so that large projects can benefit all.

IRCAA Corridor Plan

The IRCAA study is an example of the collaborative planning described above. Many projects came out of the IRCAA (4), including a 26-mi segment in Utah and Salt Lake Counties that resulted in an EIS in 2004. Additional corridor studies have been conducted for the north and south regions of the state. A corridor plan for I-15 from Kaysville to Ogden was started in March 2005. UTA is constructing light rail from Weber County to Salt Lake City to open in 2008. All of these projects were based on the same IRCAA report that examined interregional transportation solutions. As with the cooperation among MPOs noted above, the IRCAA study looked across regions to examine alternatives that were being considered in other regions. One WFRC interviewee noted, “It’s difficult to get people to take planning studies seriously.” However, adequate coordination and planning make project development much easier to anticipate and fund. It also ensures that projects, goals, and objectives from the various regions can be optimized and larger transportation solutions such as commuter rail are adequately considered.

Active Participation of Local Governments

“The best thing we did,” said a UDOT member, “was develop that steering committee. When we came up with these hot issues, it was nice to be able to talk about all the issues with them and get their perspectives.” Each political body had its own agenda for the I-15 NOW project, but the steering committee was an effective forum for mediating among them. Each could hear the other’s point of view and knew the motivation behind specific decisions. UDOT said, “It was important that they heard each others’ needs and position so they would know what was going on.” Competing interests revolved not only around traffic solutions, but also the socioeconomic concerns of funding and spending. A WFRC interviewee said, “If Salt Lake was going to get money, then other areas of the state wanted it too. It was balancing other community interests and those of Ogden.”

Railroad Coordination

With the number of rail crossings for the I-15 NOW project, as well as the volume of traffic on some of

the lines, coordination with the railroads could have been a major barrier to the highway project. Instead, the issue was anticipated by project personnel and handled effectively. UDOT had prepared preliminary master agreements with the railroads during the NEPA process. UTA was already working with the railroads on commuter rail corridors. These factors probably helped the I-15 NOW project. The railroad crossings, and the coordination required of them, could have been very difficult elements of the project. However, UDOT negotiated effective agreements with the railroads. Additionally, many of the specific details, such as coordinating construction with the railroad schedules and specifications, were made the responsibility of the design-build contractor. In the end there were no major problems or delays associated with the railroads.

Key Innovations

Design-Build Concept

The design-build approach distinguished the I-15 NOW project. A UDOT member said, “We took the lessons learned from the \$1.5 billion design-build project for the Olympics to new projects.” In this case, the design-build considerations were largely outside the planning and development processes. A member of the Baker consulting team said, “We never knew if it would be design-build while doing the [EIS], but we kept our options open for design decisions.” The design-build process is quicker and generally more efficient than the standard design-bid-build process.

One Baker interviewee said, “Is design-build going to be the new process? I think they get a lot of state money based on promises and being able to deliver capacity quickly. It will likely be a growing trend.”

Innovative Contracts Engineer

The design-build process requires modification of the standard contracting aspect of highway projects. UDOT stated that it “tries to look at new innovative ways to deliver contracts and ways to deliver jobs.” To that end, UDOT has a designated innovative contracts engineer who researches contract structures

throughout the United States, searching for ways to improve DOT operations. In June 2007, UDOT posted an announcement to hire another innovative contracts manager. The position responsibilities included the following:

- Develops new and innovative processes and procedures to be used in the development and construction of transportation systems;
- Develops thorough coordination and cooperation with state, local, and national transportation groups including AASHTO;
- Becomes involved on a national level in the innovative contracting field;
- Coordinates with Utah legislative parties to possibly change laws currently governing the bidding of transportation construction projects;
- Develops and maintains the innovative contracting program for UDOT, including developing templates, procedures, and specifications;
- Trains and provides guidance to all UDOT personnel on the innovative contracting program.

“We dealt with ramp rental innovatively—for each extra day the contractor kept the ramps closed, we subtracted \$4,000 from their contract,” said one UDOT member. “Alternatively, if he finished in [fewer] days, then we added that for each day. There was a disincentive if he closed it more than once as well. It’s the same concept as road rental, but we applied it to ramps as well to make it better for the local residents.”

ACTT Workshop

As a result of the 2002 Winter Olympics, Utah was experienced with rapid design and delivery of highway projects. The I-15 NOW project refined that process further by incorporating an ACTT workshop, which provided a valuable jump-start to the design process. A UDOT member said, “I heard about it from our innovative contracts engineer. It came from FHWA. FHWA called UDOT looking for opportunities to do a workshop.” Since the I-15 NOW project, ACTT workshops have taken place in 25 states.

Barriers Encountered and Solutions

Maintaining Service

The goal of maintaining two lanes of traffic in each direction for the duration of the project was taken up by the ACTT workshop. UDOT noted, “[The] real challenge was how to maintain the road and manage traffic while constructing the road. It was difficult with changes in alignment and the narrow bridges.” The process was woven into the contracting, giving incentives to the contractor for maintaining service. In the few cases when the entire roadway had to be shut down, these activities were scheduled for off-peak times.

The highway lanes presented fewer challenges than the railroads, which did not present any alternatives for disruption of service. As a result, the design-build firm must coordinate activities around the railroad operations. That coordination includes obtaining agreements and permits as well as following the railroad guidelines for construction. In addition, they must take into account a potential railway, the new commuter line that UTA is constructing.

Funding and Scope

The costs on the I-15 NOW project appeared to shift regularly, but this was a result of the shifting scope of the project. The scope was never firm, and the planning and NEPA process were guided by the principle of trying to get as much roadway as funding would allow. The consultants from Baker projected costs in the EIS relatively close to the final costs for the project. However, funding was uncertain throughout the process. The NEPA process made contingencies for additional funding, and the committees established a scope of improvements that required additional funding. All players made contingencies for the possibility that there might be additional funding, including phasing the construction, without knowing whether it would be the case.

Funding fluctuated throughout the project; as a result, it was noted in the EIS as available funding. The roadway was initially conceived at \$180 million, and that amount had been approved by the

legislature. In June 2005, the project manager gave a presentation before the county board of commissioners and indicated that he did not believe UDOT could complete the project for \$180 million (18). By 2006 the estimate had grown to \$233 million on the basis of the preferred alternative (19). By June 2007, the estimate was \$265 million. Reasons for these increases are unclear. Fuel taxes are the primary source for transportation funding in Utah and in 2003 made up 73% of the Transportation Fund revenue. From 1997 to 2003 fuel taxes made up 12% of the CHF. UDOT is supposed to administer the spending of state funds such as the CHF, but control over its allocation is different. The legislature controls the Centennial Fund.

As recently as January 2006, the project was slated to extend only from 31st Street up to 12th Street because of funding (20). In May 2006, the project was amended to put all aspects into one phase, and the legislature appropriated the money. The estimated total cost of the I-15 NOW improvements is \$260.3 million. Funding was allocated into 2009.

A WFRC member explained, “When they did the plan 10 years ago, they didn’t really have time to estimate costs. They found the Weber County I-15 project and a few others where they underestimated the costs. So UDOT goes to the legislature, which typically agrees to fund the project that they agreed to the scope of.”

Opportunity Missed: A Separate Study at 24th Street Interchange

The 24th Street interchange has become a separate project of its own. Although Ogden was dissatisfied that the end result of the I-15 EIS did not contain a full interchange, budget constraints were a strong

factor. Figure 4 shows that a full interchange at the location was evaluated in the EIS as an option with an estimated cost of \$51 million. Construction would affect eight additional Section 4(f) properties, six residences, and three additional businesses. The community is disproportionately Hispanic and low income. “Ogden City wanted that to be a full interchange,” said a UDOT interviewee, “as did FHWA, and had pushed hard for it. But the legislature gave us a large scope with a tight budget, and that interchange would have dramatically impacted the scope—lowered the number of lanes.” WFRC interviewees asserted that the city did not have a redevelopment plan for that part of downtown, and consequently “it never came up as a problem on our models.”

The option to upgrade the 24th Street interchange was considered in the I-15 NOW plan but not adopted into the final design because of cost and impacts. The debate process for I-15 NOW brought the interchange issue to the forefront of the community and the city. The neighboring cities feared that if the 24th Street interchange were built, the length of the roadway would have to be shortened and the neighboring municipalities may not receive desired improvements. One interviewee indicated that the

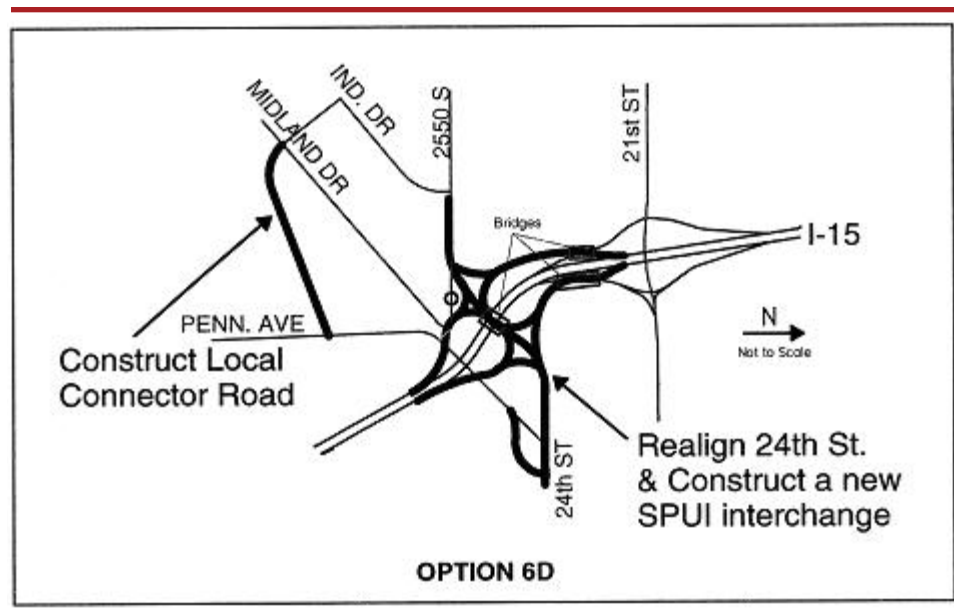


Figure 4. One proposal for reconstructing the 24th Street interchange (2).

steering committee's active involvement is what kept the issue out of court. UDOT found the interchanges at 21st Street and the 31st Street Industrial Park to the west of the 24th Street interchange to be sufficient, "but the public and the industrial park," noted a member of WFRC, "want[ed] direct access to downtown and to the interstate." UDOT agreed to undertake a separate environmental study for the interchange, which will be reconstructed into a full interchange project separate from the I-15 NOW work. A member of the Baker team said, "The city has since done a planning study, but it wasn't available at the time. We told them the interchange would need an economic base. It's not based on traffic."

The Era of Megaprojects

"All projects like this, even I-15, we have a hard time putting on our plans because they seem too big—maybe more than we could handle," said a WFRC member. Increasingly, the nation's highways need more maintenance and reconstruction. Project scopes have grown larger. Planners have streamlined the development and environmental review processes. Engineers can find ways to accelerate design through national working groups such as ACTT. There is still, however, the issue of funding. As projects get larger, more money is required at one time. Projects that can be completed in phases allow for a more fluid cash flow process. However, they require more complex organization and scheduling, and only careful integration of project phases and parts will avoid redundant expenditures.

For the I-15 NOW project, a UDOT interviewee said, "the legislature wanted it done the whole way, and they elected to fund it to be all done at once." The I-15 NOW project does not qualify as a megaproject by FHWA standards, which is a project valued at \$1 billion or more. However, I-15 NOW is one of the largest projects ever undertaken in Utah; the project benefits the state in more areas than just transportation. Opportunities for joint infrastructure were identified during the I-15 planning and development through meetings among the various cities along the corridor. Opportunities

included further development of the local trail system, storm water system improvements, and additional aesthetic treatments of design features, such as structures, lighting, and landscaping. In some places, I-15 is both a physical and financial barrier to trail implementation. Some of the storm water features provided by the I-15 storm water system could assist local municipalities in updating or establishing portions of their own systems. These potential benefits require that municipalities have adequate growth plans in place, and have potential funding sources that will enable them to take advantage of joint development opportunities when they arise. Methods to accelerate design and lower delivery costs have allowed highway projects to get bigger. They also lead to questions about indirect impacts to other sectors of land use, urban planning, and community growth. Ultimately, for the I-15 NOW project, potential joint development opportunities were left to be finalized during the design-build phase of the project, and it is unclear whether any have moved forward.

CONCLUSION

The planning and development of the I-15 NOW project was a successful outcome of an overall high-quality process. There were key decisions made along the way, but as part of an efficient process those decisions were not large risks but simply steps in the planning and development scenario. The design-build approach to delivery, although not yet complete, is surely a cost savings. With the state's investments in substantial long-range transportation planning, as well as a commitment toward creative contracting structures, such decisions can be made with confidence. Program assistance such as FHWA's ACTT process provides additional supporting resources that allow states to explore new project structures while minimizing the potential for risks. The next step is aligning the funding considerations earlier and integrating them into the process in the same way.

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