Project Update

COMPLEX CONNECTION

Workers stand in a demolished section of the Water Street Bridge, alongside a new concrete retaining wall tied back with earth anchors providing stability to both the bridge and nearby homes. Dawson Construction took the old Water Street Bridge apart in 20-foot increments and placed in new concrete surfaces following a phased plan to minimize impact to residents. The bridge is located 75 to 100 feet from sea level, which meant steep work in a tight place.
PHOTO COURTESY OF ALASKA DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES

By NAOMI KLOUDA

Ketchikan's latest Water Street Bridge Project, which was recognized for its completion in June, posed numerous design and construction challenges from its perch at 75 to 100 feet above sea level.

Decaying wood pilings and bolts loosening from their boreholes in mountain bedrock meant that garbage trucks, fuel tankers and fire trucks could no longer safely use it. Affixing a new bridge in a tight spot on steep terrain made the project unique and required inventing a new piece of equipment.

PHOTO COURTESY R&M CONSULTANTS

Young Ketchikan residents help cut the ribbon at the June 28 celebration marking the completion of the $22 million multi-phase project.

The corridor began in the late 1800s as a trail between north and south Ketchikan, then homes sprouted up generationally. It was named Water Street because the trail began on the beach in the old days. Some of the homes nearby are on the National Registry of Historic Places.

Ketchikan's Mayor, Bob Sivertsen, was born in the coastal town in 1950.

"(The bridge) has been here as long as I can remember and was reconstructed over the years. The last year it was rebuilt was by Dawson Construction in 1979," Sivertsen said.

Because of the bridge's long history connecting services to Ketchikan, excavating old lines and putting in new bridge parts contributed to its complexity, Sivertsen said. Neighbors along the corridor were more than ready for the improvements.

One house was demolished as part of the project. Among the improvements the project brought was an updated fiber-optic line and new network node, which allows customers served by the lines to be split into two groups instead of one on a single distribution line, meaning increased bandwidth for users.

Ketchikan's historic Water Street Bridge gets overhaul in close, elevated quarters

On June 28, the town celebrated the completion in a ribbon-cutting ceremony with Sen. Bert Stedman, R-Ketchikan, Mayor Sivertsen, Department of Transportation & Public Facilities Commissioner John MacKinnon and local residents in attendance.

"It was quite a project, and now it's complete," MacKinnon told the group. More than 116,000 labor hours went into its completion, he said. The project left improvements in place far beyond the scope of simple bridge construction.

DOT&PF took on the $22 million project in 2015, though planning had begun in 2011. Sivertsen said Ketchikan had advocated for the project funding as a high public safety priority, because it is a critical — and the only — route for residents to 18 homes built near the bridge over time. It also functioned as a bypass to Tongass Avenue, situated on the steep hillside above it.

Designers at R&M Consultants Inc. in Anchorage sought ways to overcome unique challenges presented by this one-of-a-kind project, said Tim Grier, the R&M project manager who oversaw design.

Dawson Construction of Bellingham, Washington, with offices in Ketchikan and Juneau, handled the construction work, with administration provided by HDR Alaska. Separate work was completed by utility providers Ketchikan Public Utilities and GCI.

As happens over time, utility companies' lines crisscrossed overhead on the bridge, which is built into the mountain overlooking the busy seaport below. Houses had been integrated into the bridge construction, Grier said.

"To put it the polite way," water and sewage piping was situated in a riff-raff of various configurations, depending on the home's construction generation, he said.

"Houses' foundations were literally connected to the bridge in some cases," Grier said. This raised the question of whether some homes would collapse once old parts of the bridge were removed. Many utility poles were built into the bridge and some were supported by the bridge.

To get a picture of some of the issues: "The existing bridge is only one lane wide, but you have to put two-way traffic on it. It's mostly uphill to downhill, so there's space you need to provide to pull over and let the oncoming vehicle pass," Grier said.

Engineers saw early on they couldn't tear down the old structure and start afresh because of the inter-dependent infrastructure between residential homes, roadway and utilities.

"If we did tear it down, the residents wouldn't have any way to get to their houses," Grier said.

Instead, the old bridge was demolished in 20-foot increments and the new bridge system was designed so that replacements could be fit in place, piece by piece.

PHOTO COURTESY R&M CONSULTANTS

The finished Water Street Bridge project, seen from the air, includes new construction of a 1,000-foot-long hybrid concrete-steel trestle bridge system consisting of a 700-foot pile-supported concrete deck panels, 200-foot retaining wall on both sides with fill, and a 100-foot prestressed concrete deck bulb tee girder span.

PHOTO COURTESY R&M CONSULTANTS

Utility lines that crisscrossed the road and were closely bundled along its length in this photo of the pre-demolition bridge. In order for construction work to proceed, an advanced utility relocation project rerouted transmission lines along alternated corridors. Utilities that remain were mostly relocated to below the bridge deck including the Ketchikan Public Utilities water, sewer, electrical power, TV and telephone.

PIECE BY PIECE

The Ketchikan Water Street Bridge Rehabilitation project began in June 2016 split into eight phases. The project's scope involved removing and replacing the "existing timber and concrete trestle structures, utilities and associated earthwork, grading and placement of asphalt concrete surfaces," according to Dawson's project proposal.

New construction included a 1,000-foot-long hybrid concrete-steel trestle bridge system consisting of a 700-foot pile-supported concrete deck panels, 200-foot retaining wall on both sides with fill, and a 100-foot prestressed concrete deck bulb tee girder span.

One of the first actions involved learning about the unique, individual foundations of each of the 18 homes, Grier said.

"Some were on pilings. Some were built into rock walls. The wall of the bridge was found to be literally holding up the yard or front part of some of the homes," he said.

R&M suggested using steel tie-backs to a concrete holding wall so houses or driveways wouldn't "lean on the bridge anymore," Grier said.

Construction began with beefing up support, which meant pouring new fill beneath some of the homes.

Another issue that needed confronting early on was how to deal with the copious rainwater that contributed to eroding the bridge in the first place, Grier said.

To solve that problem, the design incorporated a new drain system.

"We provided drains for each lot, catch basins that piped to a storm-drain system below," he said.

Dawson Construction, working in the tight, steep space, had no flat places to stage equipment and work, said Gary Hovde, Dawson's senior project manager.

"The biggest challenge on this project was the width and the area we had to work in was small. The road was 25-feet wide. There were two conditions that restricted us," Hovde said. "There were either houses on both sides (of the road) so we couldn't spread from the sides, or houses were on the uphill side. We were restricted in how we could move materials and equipment along the job site."

INVENTING THE PANEL LAUNCHER

Another challenge was how to maneuver large steel and concrete pieces into place, working with 20-foot slabs to form the bridge deck.

"We couldn't bring a large crane in to set material down. We had to invent an equipment-handling method to keep to that narrow space," Hovde said.

Dawson essentially invented a new crane by modifying lift and drilling equipment, he said.

"The existing bridge meant we could only use lighter-weight equipment. To dismantle the bridge, we had to use smaller equipment," Hovde said.

"For handling — it's pretty hard to picture — but if everything is linear, the new concrete panels that went onto the deck were the full width of the street. We couldn't move sideways. Power poles and buildings were in the way. So we had to turn length-wise to get up the street. Then to put each (concrete panel) in place, we turned it. We built a trolley system on wheels and picked up the panel length-wise. Then the system turned the panel and set it out in front of that equipment with the trolleys."

They dubbed their invention, the panel launcher but had to dismantle it after the specialized role was completed, Hovde said.

Back in 1979, when Dawson last did maintenance updates on the bridge, Hovde said his dad, Jack Hovde, was in charge of the project.

"At that point, it was an all-wood structure: wood pilings and wood decking for the driving surface," he said. "The wood deck was taken off and (Dawson) installed precast concrete deck panels onto the existing pile structure. Utilities underneath were left alone at that point."

PHOTO COURTESY R&M CONSULTANTS

A section of the new bridge was closed in late June for the long-awaited ribbon-cutting and official opening. The photos show how tightly houses and utility lines are clustered along the road, which leads to the waterfront, where cruise ships are docked in the distance. Dawson Construction invented a piece of equipment, dubbed the panel launcher, that allowed placing 5-foot by 20-foot concrete panels into place in tight space.

This project was much more comprehensive.

"We rebuilt the foundations, pilings changed to steel columns and retaining walls. Then a whole new pre-cast concrete deck system on top of that," Hovde said.

FUTURE-FRIENDLY BRIDGES

Now that the Water Street project is complete, Ketchikan residents look forward to work updating a smaller but similar project just down the road. It's called Water Street Trestle No. 1. R&M Consultants Inc. will be applying lessons learned from Water Street project — such as maneuvering equipment in a tight space — to Trestle No. 1.

That project, currently in the design stage, should begin in 2020-2021, Grier said.

Naomi Klouda is a freelance writer living in Anchorage.