Culverts: A Hidden Risk

Inspection Program Years from Completion

Sinkholes, which are usually caused by "voids" created in the compacted material that surrounds a failed culvert under or around traveled roads, can disrupt the movement of people and goods.

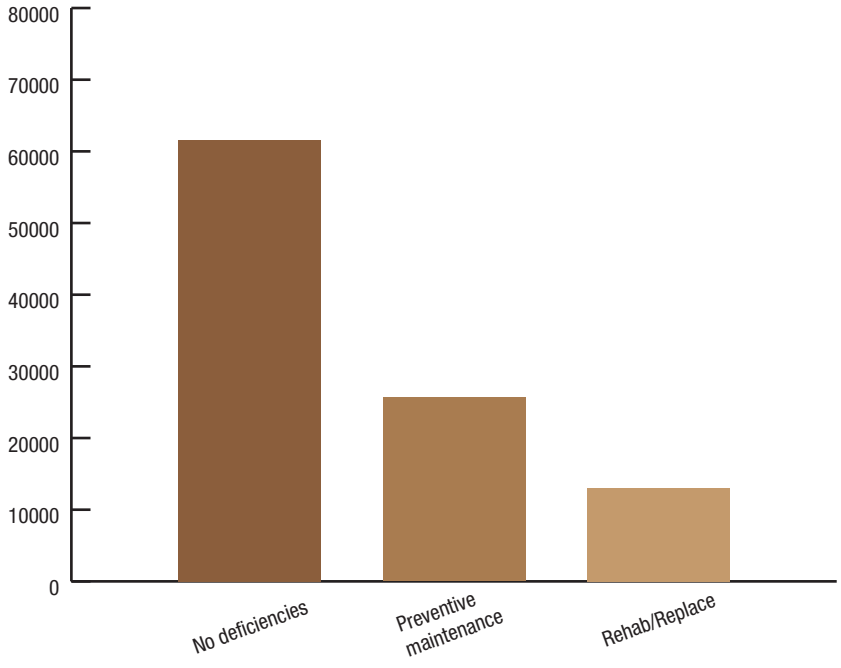
There are more than 200,000 culverts running below California's highway system.

When functioning properly, this massive drainage network safely channels stormwater in a way that prevents erosion of the roadbed and limits the risk of flooding in adjacent areas. When clogged or collapsed, however, culverts represent a significant risk to the highway system, which is why Caltrans embarked on a comprehensive inspection program in 2005.

Now at the halfway point of this multiyear effort, inspectors have identified about 13,000 culverts in need of rehabilitation or repair and about 26,000 that required preventative maintenance. At the present rate of inspection, it will take about nine more years to complete the task, which leaves a sizeable question mark about the condition of some 100,000 culverts.

The goal of the Maintenance Culvert Inspection Program (the effort begun in 2005) is to inventory and assess 100 percent of the culverts within the state right-of-way.

Culvert Health



Source: Division of Maintenance

The video inspection pipeline exploration rig (VIPER) is used to assess the health of culverts too small for a person to enter.

The Microtraxx Tunnel Mucker is a radio remote-controlled front end loader. The Mucker allows safe and easy access to box culverts and ditches for cleaning purposes. These areas can otherwise be hazardous or difficult to access.

Since the program began, inspectors have assessed a little more than half of the estimated 205,000 culverts in Caltrans' inventory.

Of the culverts that have been inspected, about 61 percent are in good health, 26 percent need corrective or preventative work, and about 13 percent need either major rehabilitation or replacement.

It will cost $490 million annually over a 10-year period, according to estimates, to fix the 13 percent of culverts that need major work or replacement under the State Highway Operation and Protection Program (SHOPP). Corrective and preventative work is funded by the State Highway Account, currently at $5 million per year plus support costs.

The Maintenance Culvert Inspection Program demonstrates the benefits of the "fix-it-first" philosophy embraced by Caltrans. Experts estimate every $1 spent on maintenance now saves $4 in major repair costs. The average repair or preventative work for each culvert costs about $50,000. The cost of rehabilitating or replacing culverts ranges from $40,000 to $1.4 million, depending on location, type of work required, environmental, and other factors.

With the growing backlog of needed repair, culvert drainage restoration projects have received additional emphasis to keep up with the delivery of projects. The annual SHOPP Drainage Rehabilitation allocation was raised from $11.3 million in 2013 to $41.7 million in 2014.

Why Clean Culverts?

Culverts fail over time for various reasons, such as usage, age, and environmental conditions. Some common causes for culvert failures are clogs, pipe damage, washouts, rusted or failed inverts, cracked concrete, exposed or corroded reinforcing steel, joint separation, and backfill infiltration. Culvert failures can be a hazard to the traveling public. They can cause traffic delays, require costly repairs, and interrupt the transportation system. Culvert failures can also damage the surrounding riparian environment. Debris and sediment from a culvert failure can clog streams and creeks and impede migrating fish.

Technology Keeps Pace

Culvert work is important, but it can be difficult, often requiring road closures to provide safe access. Robotic equipment is used where possible, entering small and potentially dangerous areas and sending information back to its human handlers. Some locations, of course, are not suitable for the robotic crawlers. Inspectors also use a remote-controlled culvert excavator called the Microtraxx Tunnel Mucker, which has had limited use throughout Caltrans. Four Muckers, used to clear culverts filled with sediment and debris, are rotated throughout the state. The Mucker has shown to be effective in removing debris, but this method is not appropriate for all locations.

Administered by the Office of Stormwater and Environmental Compliance, the Maintenance Culvert Inspection Program has an annual budget of about $5 million. Each Caltrans district has at least one culvert inspection crew and a functional database used to manage its culvert inventory.

Source: Division of Maintenance