



# REMOTE IMAGING OF CULVERTS AND DOWN-HOLES

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## WHY?

During a typical highway design and construction process, the need to assess the condition of existing culverts, cross-drains, and under-drains was the primary reason for acquiring the Rovver® 600 robotic remote imaging tool. This assessment is especially important for the small diameter pipes located under high fills and retaining walls that cannot be inspected manually. Use of this tool has allowed our highway engineers to make “fact based” decisions in either replacing these pipes or accurately identifying the locations for rehabilitation using trenchless technologies. The geotechnical engineers have utilized the down-hole capabilities of this tool for verification of newly installed slope stability measuring devices as well as condition assessments of existing installations. The ability to position the camera into confined, normally inaccessible or unsafe areas allows our construction inspectors to verify structural reinforcement spacing, placing, and clearances for quality assurance and quality control purposes. The ability to push the camera into openings as small as two inches allows for the inspection of most in-place drainage systems and naturally occurring features. During the design process, the data collected once can be shared many times throughout the project life cycle with all of the primary stakeholders.

## THE ROVVER® 600

The Rovver® 600, manufactured by Everest VIT, Inc., is a self-propelled, remotely operated motorized crawler. The versatile and modular component design provides the capability to inspect inside pipes with diameters ranging from 2- to 36-inches. The Rovver can be outfitted with either an axial camera head for down-hole and push pole applications or with a pan and tilt camera head using a fully articulating, manually focused, low-lux lens for larger pipes. Both these lenses will provide digital video and digital still images. The camera heads can operate independently of the Rovver crawler assembly. Both of these camera heads contain an embedded ring of LEDs around the perimeter of the lens to provide lighting.

## THE ROVVER APPLICATIONS

The Rovver was used to assess the condition of all major poured-in-place box culverts installed by the CCC in the 1930s at Alder Camp Road in the Redwood National Park in California. Ryan Tyler, Project Manager, Federal Highway Administration, realized benefits of using the Rovver:

*“The ability to actively view the drainage structures on the Alder Camp affords us the ability to make ‘fact based’ decisions, which significantly mitigated the risk of our decisions. Our clients the National Park Service also took part in this effort which added support and buy-in for the hydraulic recommendations at these sites, and strengthened our overall team. Although the use of the Rovver increased PE costs, that amount is minute compared to the potential associated construction costs reflecting unknown conditions of in situ structures (in the case of Alder Camp Road).”*

The use of the Rovver tremendously helped the project team in their overall hydraulic analysis and condition assessment of the existing structures in order to accurately determine the appropriate treatment/rehabilitation efforts required. Several box culverts did not require replacement as initially estimated resulting in significant cost savings.

The Rovver was also used to assess the condition of a 24-inch culvert on the Swamp Creek – East Project located near Libby, Montana. The inlet of the pipe was dry while the outlet was producing a steady stream of water. Richard B. Jackson, Geotechnical Engineer, Montana Department of Transportation was aware

that the culvert was being fed by collector pipes that ran parallel to the highway; however, the exact location and number of collector pipes, as well as the overall condition of the entire spring collection system was not apparent to Montana DOT engineers. After using the Rovver to collect data, Richard Jackson stated:





*“The information provided by the robotic camera will be invaluable in the design of the roadway embankment and culvert. A decision has to be made as to whether we extend the existing culvert or build a new culvert and spring collection system. It is estimated that the information obtained by the robotic camera has a ‘value added’ of up to \$100,000. This ‘value added’ is derived from being able to better design the culvert which will help avoid costly change orders and claims during construction.”*

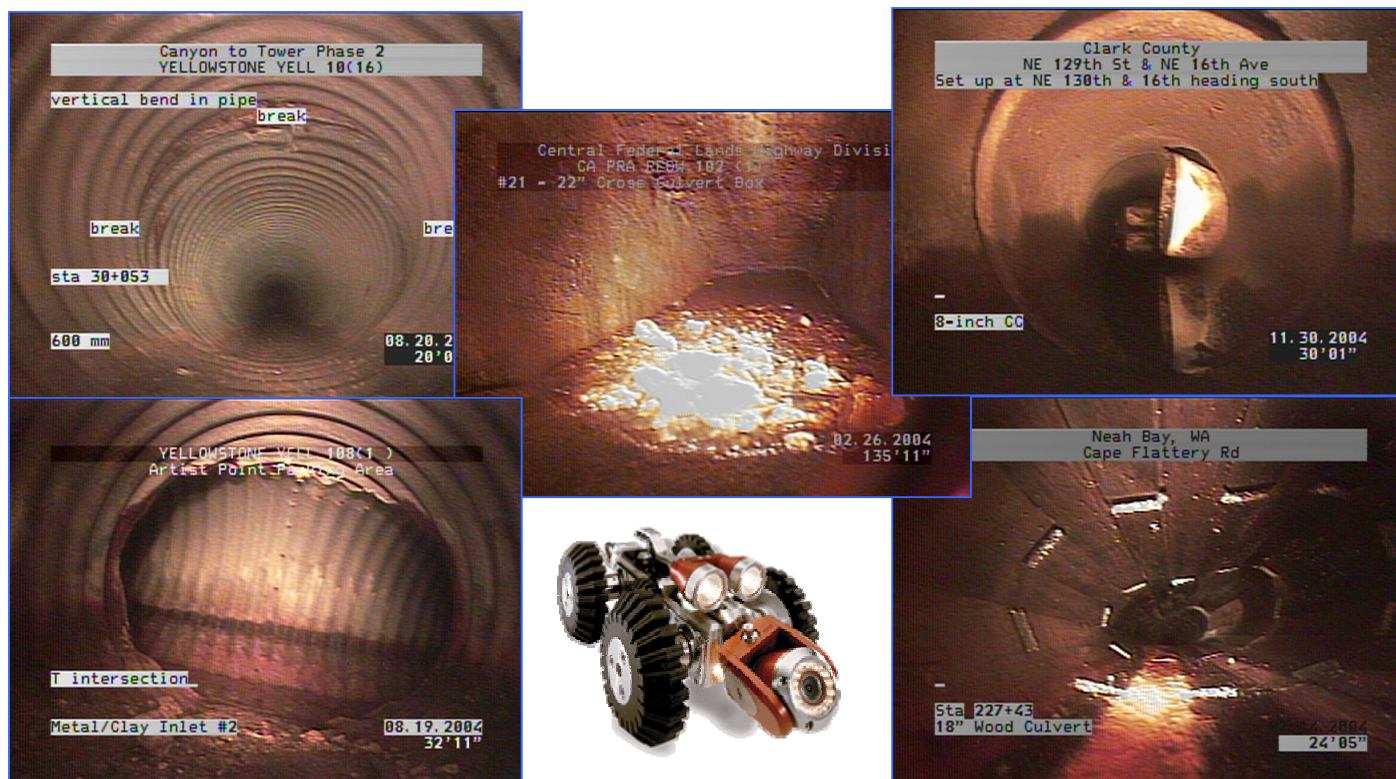
In this particular case, the use of the Rovver provided the Montana DOT design-staff the condition assessment of the 24-inch culvert and the precise location and number of collector pipes feeding into this culvert.

### THE ROVVER AVAILABILITY

The Rovver is available for use, free of charge, to any State, County, or City Transportation Department as part of the Technology Deployment Program of Western Federal Lands Highway Division in Vancouver, WA. The Rovver can be requested through your local LTAP/TTAP center or directly through WFLHD (Amit Armstrong, 360-619-7668).

### ROVVER SPECIFICATIONS

-  Depth Rating: 1 bar (14.7 psi)—Equivalent to water depth of 10 m (33 ft)
-  Temperature Rating: 32°-150° Fahrenheit
-  Power Supply: AC Inverter connection to inspection vehicle battery
-  Video Format: MiniDV Tapes



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