

# Application Note

## Improve Landfill Design with Continuous Water Level Monitoring

*Rugged TROLL® Instruments provide critical data for expansion studies and daily operations*

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### Application

Long-term groundwater level measurements at solid waste landfill sites are used to determine highest measured groundwater levels and rainfall/recharge relationships. Landfill design engineers and regulatory agencies use this data to assess the feasibility of expanding landfill sites and to develop site-specific design requirements.

### Characterizing groundwater for proposed landfill expansion

Before a municipal solid waste (MSW) landfill can be expanded, hydrogeologists and engineers must evaluate groundwater conditions and behavior. These studies fulfill state and federal regulatory requirements and improve engineering plans. Hydrogeological landfill assessments determine:

- Site-specific geology and hydrogeology of the subsurface materials beneath the expansion area
- Uppermost aquifer dynamics and potential presence of perched saturated zones
- Groundwater confining units
- Groundwater quantity and quality
- Site-specific rainfall/recharge relationships
- Potential contaminant migration pathways
- Site-specific landfill liner design and underdrain issues
- Optimum locations and depths for groundwater monitoring systems.

Landfill design engineers conduct daily and monthly groundwater level studies at landfill sites to facilitate lateral expansions. Depending on regulations, consultants may monitor water levels for at least a year to determine the highest seasonal groundwater elevations. Some regulations require daily monitoring of at least one expansion area piezometer.



*Rugged TROLL® Instruments are deployed in off-site monitoring wells near a landfill to track groundwater levels.*

The results of these water level studies are used to determine the need for landfill underdrains, groundwater diversion trenches, engineered gravity feed systems, groundwater cutoff structures, or other landfill design specifications. In addition, engineers can determine the disposal volume for an expansion, leachate contingency plans, and the potential for landfill liner failure.

### Low-cost solutions add benefits

Consultants may be monitoring more than one landfill with numerous monitoring wells. Collecting data from many sites can pose staffing challenges. Technicians pressed for time to collect all the necessary data may make an occasional mistake or miss a measurement. To reduce overall equipment and personnel costs and to improve the quality of data, In-Situ® Inc. offers economical water level monitoring solutions. These instruments allow data collection around-the-clock, instead of manual weekly or monthly measurements performed by field technicians.



*Rugged TROLL® 100 Instrument with a docking station for downloading data.*

In-Situ Inc.'s titanium Rugged TROLL® 200 and Rugged TROLL® 100 Instruments provide continuous data collection, eliminate chances for error, and reduce operating costs. Instruments can be programmed in the office and installed at key monitoring wells throughout a landfill. In addition, the Rugged TROLL 200 Instrument can be connected to a PLC system, logger, or TROLL® Link Telemetry System for remote data access and alarming.

### **Continuous data collection can reveal unknowns**

Once a consultant installs Rugged TROLL Instruments at data-collection points, such as expansion piezometers and monitoring wells, the devices start collecting reliable data. Because Rugged TROLL Instruments operate day and night, consultants can characterize groundwater events in more detail and may discover aspects previously uncharacterized. A Rugged TROLL Instrument can detect varying, and possibly subtle, trends in groundwater system behavior. For example, continuous monitoring helps engineers understand:

- Recharge characteristics such as rates of rise and decline after precipitation.
- Site-specific geological formations that may not have been detectable with core samples or with geotechnical laboratory hydraulic conductivity tests.
- Generic landfill design features that may be precluded from use due to unique site conditions.

### **Data used to improve landfill designs**

With continuous level monitoring at several sites over extended periods, consultants acquire detailed knowledge of regional groundwater issues. With this information, engineers can customize expansion designs to meet each customer's budgetary and regulatory requirements. In addition, better designs extend landfill life and maintain groundwater integrity.

### **Economical solutions reduce costs without skimping on reliability**

The absolute (non-vented) Rugged TROLL® 200 and Rugged TROLL® 100 Instruments offer the reliability you demand at our lowest cost. The titanium body offers chemical- and corrosion-resistance for deployments in all types of environmental waters. Set up the instrument and download data via a docking station (USB or RS232 connections) or via direct-read cable and the Rugged TROLL® Com (Rugged TROLL 200 only). Rugged TROLL 100 and 200 Instruments come standard with Linear, Fast Linear, and Event logging modes. For more information and full instrument specifications, visit [www.in-situ.com](http://www.in-situ.com).

### **Application Technologies**

- Rugged TROLL® 200 Instrument
- Rugged TROLL® 100 Instrument
- Rugged TROLL 200 direct-read cable
- Docking station
- Rugged TROLL® Com
- Rugged Water Level Tapes and Meters
- RuggedReader® Handheld PC
- Win-Situ® Software
- TROLL® Link Telemetry Systems
- TROLL® Link external battery and solar panels

### **For more information contact In-Situ Inc.**

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