AUTOMATED ENVIRONMENTAL MONITORING AND DATA VISUALIZATION FOR STREAMLINED GROUNDWATER MANAGEMENT

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Abstract

Manual collection, analysis and interpolation of field data is costly and time consuming. As a result, data sets tend to grow large over time and performance and Long Term Monitoring (LTM) of contaminant releases represent a significant portion of the overall budget for meeting environmental restoration goals. Integration of near real-time sensor data processing attributes, multivariate analyses, supply estimates and maximum sustainable extraction strategies. Groundwater vapor sensor data. When practical, virtually any type of sensor that is connected to telemetry can be integrated into the automated monitoring package. Multivariate analyses and visualizations can also be automated.

Technology Description

The figures below display the general system components for environmental monitoring. Field sensors are linked to data loggers and telemetry systems, which transmit the data to a remote location where data are automatically processed and stored. The system can be customized to automatically generate reports, and to trigger alarms, pumping rate adjustments and emergency response plans. Sensors can be deployed in wells, surface water, and air. Data processing and management are automated, as is organization of the visualizations (e.g., single time stamped graphs, multi-geo graphic tiles, animation loops, and expert capabilities). Since the systems are web-based, no special software is required, and access is through a password-protected browser, thereby enabling users to monitor sites from any location or device with an Internet connection.

Benefits

• Lower equipment requirements and carbon footprint
• Reduce liabilities
• Significant time and cost savings (>50% after 5 years)
• Logistics reduction (i.e., permitting, security passes, report generation, labor, analytical, etc.)
• Facilitates remote monitoring and simultaneous multi-site monitoring
• Scalable (site, facility, regional, national, global)
• Password-protected web-enabled (no software downloads)

Acknowledgements

We are grateful for assistance provided by Gary Gaughran (GT), Nick Brower (GT), Mike Lamar (Ascanio.com), Alexander Guy (Okori), Dr. Scott Burge (BE), Gregg Gustafson (INW), and for our clients and collaborators.

References


Groundwater basin storage tracking

Water demand is growing in many parts of the nation. As a result, a new approach for sustainable water management is gaining in popularity. For instance, sophisticated managed underground water storage is becoming more common, as diams and reservoirs pour unique challenges such as lack of reliable data, ecological considerations and high evaporation rates. Dry wells, surface diversions and infiltration ponds can be used to artificially recharge groundwater basins. Some communities are even routing treated waste water and storm water into aquifers to increase storage, help control subsurface intrusion in coastal zones, and to decrease runoff. While managed underground storage can be a viable option, it is essential that water levels and storage changes be monitored frequently (National Research Council, 2008). The image below displays water level contours that can be generated automatically to monitor storage and hydraulic conductivity in groundwater basins located in Los Angeles, CA. The distribution of changes in water levels can then be tracked to data a distribution of storage change between selected time steps. Groundwater basins divided as grids, can be also be used to allow for monitoring of multiple basins simultaneously. Cumulative storage changes are automatically calculated to enable Water Masters and other responsible parties the ability to closely monitor the underground resource and generate and post reports in a timely manner.