



Real-Time Water Monitoring with Respect to Watershed Management in an Arid Climate

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Conference Tract: Watershed and water quality management

In 2012, Water & Earth Technologies, Inc. (WET) developed a Surface-Water and Ground-Water Monitoring Plan (Plan) to support the Rosemont Copper Project (Project). The Project includes an open pit mining and mineral processing operation on the east side of the Santa Rita Mountains, approximately 30 miles southeast of Tucson, Arizona in Pima County in the Santa Cruz watershed. The Project is currently going through the Environmental Impact Statement (EIS) process under the National Environmental Policy Act (NEPA), and also through a separate process to acquire an Aquifer Protection Permit (APP) with the Arizona Department of Environmental Quality (ADEQ).

The Plan was designed to supply base line data required to detect potential impacts from Project development on springs and on regional streams in and downstream of the Project area. The Plan describes a recommended monitoring network, including the location and instrumentation of monitoring stations, as well as the selection of water quality parameters and watershed health indicators for monitoring.

In 2013, WET, using HydroLynx Systems Inc. equipment implemented a turn-key monitoring network which includes real-time monitoring of stream conditions using satellite telemetry along with water quality sampling. Data are received by a central database called NovaStar5 (HydroLynx Systems, Inc.) which processes and performs alarm/notification functions. Data are made available to Project staff through a web site developed by WET called WETMap. The presentation will focus on the implementation of the monitoring network, real-time telemetry system, data collection and processing, alarm and notification functions and web display of information.



PROFESSIONAL HISTORY

Water & Earth Technologies, Inc., 2003 to present
Vice President; Principal Engineer/Flood Warning System Specialist
DIAD Incorporated, 1999 to 2003
Civil Engineer; Flood Warning System Design, Installation, and Maintenance
Riverside Technology, inc., 1993 to 1999
Water Resource Engineer; Flood Forecasting System Calibration/Implementation
Canonie Environmental Services Corporation, 1992 to 1993
Field Engineer; Mine Closure and Reclamation

EDUCATION

Graduate Studies (Theoretical and Applied Mechanics) University of Illinois
M.S. (Water Resources Engineering) Colorado State University
B.S. (Civil Engineering) Colorado State University
OSHA Hazardous Waste Site Health and Safety Training

PROFESSIONAL MEMBERSHIPS AND CERTIFICATIONS

Registered Professional Civil Engineer (CO, WY, VA)	American Water Resources Association
American Society of Civil Engineers	Certified by Campbell Scientific (2003)
Certified by HydroLynx Systems (2007/2005)	High Sierra Electronics Training (2005)

TECHNICAL SPECIALTIES

Mr. Ritsch is a professional Civil Engineer whose responsibilities include the design, construction and maintenance of flood warning and dam safety systems. Experience with various sensors, data loggers and telemetry protocols, coupled with a background in hydrology and hydraulics, allows Mr. Ritsch to evaluate, design and build specific monitoring solutions to meet our client's needs.

Mr. Ritsch has developed specific expertise with real-time telemetry solutions, including the National Weather Service (NWS), Automated Local Evaluation in Real-Time (ALERT) protocol, two-way radio systems, and real-time satellite communications.

Mr. Ritsch spent six (6) years as a Water Resources Engineer calibrating rainfall/runoff, streamflow forecasting and snow accumulation and ablation models. He has extensive experience and continued involvement with the calibration and operational use of hydrologic modeling systems. This gives him a unique perspective to design and maintain monitoring networks that produce data of high quality that are useful within a hydrologic and hydraulic context.

Mr. Ritsch consults directly to local communities, counties, state and federal agencies. He has more than fifteen (15) years of experience in surface water hydrology, hydro-meteorological monitoring, and environmental data collection. He has provided design and construction support on numerous data collection projects ranging from flood detection networks to water quality monitoring networks and automated sediment sampling programs. His areas of expertise include real-time monitoring network design, equipment installation and maintenance, conceptual planning, stream gaging, hydrology, rating curve development, radio path studies, permitting and licensing, and construction management.

REAL-TIME ENVIRONMENTAL AND FLOOD MONITORING PROJECT EXPERIENCE

Fairfax County, Flood Warning System Design, Virginia

Developed flood warning system design and construction documents to support the Fairfax County flood response, monitoring and signalization system. The real-time monitoring system was designed to address flooding concerns in New Alexandria, Huntington and at several PL566 dams. A radio telemetry backbone was designed based upon the National Weather Service, Automated Local Evaluation in Real-Time radio protocol. The monitoring network consists of weather stations and water level/rainfall stations. Radio path studies were conducted; equipment specifications and installation plans were developed; and construction oversight/field inspection was provided. The work was conducted in 2008 under the direction of Don Lacquement and Don Demetrius at Fairfax County.

Douglas County, Flood Hazard Inventory and Basin Sensativity Study, Colorado

Responsible for the assessment of flood risk for the entire Plum Creek watershed. Developed a GIS-based (ArcGIS 9.3) Flood Hazard Inventory Tool that was used to identify structures at risk and to define their physical attributes. Evaluated past hydrology and hydraulic studies to quantify flooding risk for bridges, railroad crossings, pedestrian crossings, residential structures, commercial structures and dams. Developed a methodology to identify high risk structures during a storm event in real-time. The work was conducted in 2008 under the direction of Garth Englund at Douglas County.

Grand Prairie, Flood Warning System Design, Texas

Developed construction plans and equipment specifications for an ALERT-based flood monitoring network consisting of rainfall and stream level stations. Radio path studies were completed; equipment specifications and installation plans were developed that were used to solicit construction bids.

Eastern Band of Cherokee Indians, Qualla Boundary, Flood Warning System Design and Construction, North Carolina

Designed an automated flood monitoring network consisting of stream and rain gages. The system collects stream level and rain data at critical locations and communicates the information to a central base station using the ALERT radio telemetry protocol. Prepared a radio path reasability study and construction plans for the monitoring network. Oversaw the construction of the flood monitoring system. Developed stage-discharge rating curves using HEC-RAS for three stream monitoring locations. The ratings are used by the National Weather Service to prepare streamflow forecasts to provide advance notice of flooding condtions.

Urban Drainage and Flood Control District, ALERT Data Analysis, Colorado

Provided monthly analysis of the District's ALERT database for quality assurance and control. The monthly data analysis report was used by the District to proactively focus field resources to address issues in the telemetry system and monitoring stations.

Montana Department of Natural Resources and Conservation, State Water Projects Bureau, Middle Creek Early Warning Feasibility Study, Montana

Conducted hydrologic and hydraulic analyses to quantify the inundation zone beneath Hyalite Dam on Middle Creek. Developed flood travel times associated with dam failure, identified the population at risk downstream of the dam, developed two flood detection alternatives and prepared preliminary construction costs, and developed a preliminary flood hazard mitigation plan. Recommended alternatives for protecting a large recreating population downstream of the dam consisting of fisherman and hikers. Notification methods were identified (sirens, reverse 911, cable TV, pagers, etc.) to effectively warn both the recreating population and those people living in homes along Middle Creek. The preliminary flood hazard mitigation plan was designed to be easily incorporated into the existing fire and County dispatch SOPs.

City of Loveland, ALERT Gage Installation, Colorado

Project manager responsible for the design and installation of four ALERT –based combined waterlevel/rainfall gages to expand the monitoring network for the City of Loveland, Colorado. Site investigation, radio path analyses, equipment specification, ordering, equipment configuration, bench testing and installation were performed. The new gages utilized equipment from HyrdoLynx Systems and Druck submersible pressure transducers.

Douglas County, ALERT Gage Installation, Colorado

Project manager responsible for the design and installation of four ALERT–based rainfall gages to expand the monitoring network for Douglas County, Colorado. Site investigation, radio path analyses, equipment specification, ordering, equipment configuration, bench testing and installation were performed. The new gages utilized equipment from HyrdoLynx Systems.

Goldcorp, Inc., Marlin Gold Mine Monitoring Network, Northern Guatemala

Developed plans and specifications to implement an ALERT-based monitoring network consisting of weather stations and waterlevel/rainfall stations. Completed radio path studies. One weather station and three waterlevel stations were installed. A base station was installed to receive, validate, display, alarm and notify mine personnel when thresholds are exceeded. The new gages utilized HydroLynx Systems 50386 data collection units and pressure transducers manufactured by In-Situ.

National Park Service, Lake Mead Recreation Area System Maintenance, Nevada

Provided ALERT system maintenance services for the early flood detection and notification system operated by the National Park Service in Boulder City, Nevada. The system provides early detection and local notification using a siren system for the Willow Beach and Cottonwood Cove Recreation Areas below Hoover Dam. The system is based on the ALERT protocol and monitors river stage and rainfall and is designed to automatically control audible sirens located in the recreation areas when dangerous hydrologic conditions are present. Performed hydrologic analysis of the watershed and hydraulic routing of water to determine flood inundation areas and establish upstream stage and rainfall criteria to activate the siren.

City of Loveland, Flood Warning System Maintenance, Colorado

Performs on-going annual maintenance activities for the City of Loveland’s flood warning system. Maintenance activities include the periodic calibration of rain sensors and pressure transducers and visits to each site to inspect and test hardware components. Proactive site visits are conducted three times per year. Preventive maintenance is performed once in the spring to fully activate the system prior to the rainy season, once at mid-season to ensure all components are functioning, and once at the end of the season to protect the system prior to the cold winter months. The sensor, antenna, power, transmitter, and housing systems are checked during each visit.

Town of Windsor, Additional Rain and Stream Gage Installation, Colorado

Project manager responsible for the design and installation of one (1) rain station and one (1) river stage/rain station. Both stations transmit data using the ALERT protocol on the City of Fort Collins radio frequency. The Town of Windsor and the City of Fort Collins have a cooperative partnership to share ALERT data. The new stream gage was constructed on the Poudre River and utilizes a pressure transducer housed inside a galvanized rigid stilling pipe mounted onto a concrete wing wall. Work involved site investigation, radio path analyses, equipment specification, ordering, equipment configuration, bench testing and installation, and calibration of the pressure transducer.

Clark County Regional Flood Control District, Flood Warning System Maintenance, Nevada

Managed the flood warning system maintenance support services contract for the District. Responsible for maintaining seventy (70) ALERT monitoring stations in and around the Las Vegas Valley. The District stations monitor rainfall and water level in detention facilities. Water level is measured using pressure transducers, transducer bubbler sensors, and shaft encoders. Work tasks included calibration of

all water level sensing equipment, testing of transmitter functions, testing of radio and antenna systems, and field documentation of all activities.

Douglas County, Flood Detection Network Expansion Evaluation, Colorado

Prepared a master plan to upgrade an existing ALERT-based flood detection network operated by the Douglas County Stormwater Department. The project included the evaluation of existing non-ALERT monitoring systems for inclusion of their data in the flood detection program. New rainfall and stream monitoring sites were identified to provide sufficient lead-time to mitigate damages during an event. A master radio telemetry plan was developed that quantified data loss as the system is expanded over the next 10 years. A detailed radio path study and radio transmission loading study were completed using a 500-year historical storm event that occurred in 1965 and involved fatalities.

City of Fort Wayne, Automated Flood Warning System Planning, Indiana

Prepared a master plan to upgrade the automated flood warning system (AFWS) operated by the City of Fort Wayne Flood Control Department. The plan calls for the installation of new ALERT monitoring stations and upgrades to existing stations. The upgrades include replacement of radios to meet National Telecommunication and Information Administration (NTIA) narrow band specifications and replacement of aging equipment to make the system easier to maintain. Prepared a Federal AFWS grant application for the City that was successful in obtaining money for capital expenditures for the City in 2005.

City of Flagstaff, Flood Warning System Design and Construction, Arizona

Designed an automated data collection network consisting of stream and rain gages for the City of Flagstaff, Arizona. The system collects stream level and rain data at critical locations and communicates the information to a central base station using the ALERT radio telemetry protocol. Oversaw the preparation of a radio path study and construction plans for the stations. Managed the construction of the data collection system which included the monitoring stations, base station, and radio repeater.

Newmont Gold Company, Minera Yanacocha Gold Project, Cajamarca, Peru

Developed plans and specifications to upgrade existing weather stations with real-time radio telemetry to automate the collection of data from a set of existing continuous recording (CR10X) dataloggers. Completed radio path testing and installed two radio repeaters. A base station was installed to receive, validate, display, alarm and notify mine personnel when thresholds are exceeded. Developed engineering plans and construction specifications to install a series of stream monitoring stations. These stations were designed to collect water level and water quality parameters on a continuous basis. Stage-discharge ratings were developed for each station. Sediment samplers were also installed that collect a series of 1-liter bottles when the flow at a station exceeds a pre-set value. All information from the stream gages is telemetered using two-way radio to the central base station for processing and long-term archival.

City of Loveland, Flood Warning System Construction, Colorado

Oversaw the installation of an automated flood detection, threat evaluation, and notification system for the City of Loveland. The system consists of three strategically located gages that monitor river stage and rainfall. Information is telemetered in real-time using transmitting radios to a central base station where it is evaluated against pre-determined threat levels. If these levels are exceeded, the system automatically notifies critical personnel including stormwater engineering staff, fire department staff, emergency response staff, and the police dispatch center.

City of Loveland, Flood Warning System Design, Colorado

Developed detailed plans and specifications for a real-time (ALERT) stage and rainfall monitoring network for the City of Loveland Stormwater Department. Stage sensor technologies including pressure transducers, shaft encoders, bubbler gages and sonic sensors were evaluated. Radio paths were evaluated and detailed site design and construction plans were prepared for critical monitoring locations throughout the City.