



BRUCE A. LYTLE, P.E.

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POSITION

President, Lytle Water Solutions^{LLC}

EDUCATION

B.S., Civil and Environmental Engineering, Clarkson College of Technology, Potsdam, New York, 1976.

M.S., Civil and Environmental Engineering, University of Colorado, Boulder, Colorado, 1978.



PROFESSIONAL REGISTRATION

Registered Professional Engineer in:

Colorado #18575	New Mexico #13152	Nebraska #E-12433
South Carolina #17012	Nevada #CE12158	California #72732
Alaska #CE8647	Wyoming #9159	

PROFESSIONAL MEMBERSHIP

American Water Resources Association
National Ground Water Association
American Society of Civil Engineers

Special District Association of Colorado
American Council of Engineering Companies

PROFESSIONAL EXPERIENCE

- o Managing/Founding Member of Lytle Water Solutions, LLC, Highlands Ranch, Colorado: May 2004 to Present.
- o Halepaska and Associates, Inc., Englewood, Colorado: June 1985 to May 2004.
- o In-Situ, Inc., Engineering and Environmental Science Division, Lakewood, Colorado: 1983 - 1985.
- o Woodward-Clyde Consultants, Water Resources Division, Englewood, Colorado: October 1977 to August 1983.
- o University of Colorado, Department of Engineering, Boulder, Colorado: September 1976 through August 1977.

PROFESSIONAL AWARDS

- o American Council of Engineering Companies (ACEC) Engineering Merit Award - for water supply management with Rueter-Hess Reservoir, 2000.
- o American Council of Engineering Companies (ACEC) Engineering Excellence Award - for Denver Basin Aquifer Recharge Demonstration Project, 1994.

PROJECT EXPERIENCE

Mr. Lytle has nearly 30 years of diversified project experience in designing, implementing and managing surface and ground water-related projects throughout the United States. This experience includes:

surface and ground water modeling

alternatives evaluation for the development of water resources

operational studies to determine water supply management with surface storage

surface and ground water hydrology studies

environmental contamination and remediation studies

litigation support involving water quality and surface- and ground-water hydrology

mining hydrology studies

development of water supply development and water management master plans

evaluation of complex water supply projects related to physical and legal availability within the constraints of the water rights system

Experience in surface water modeling includes the evaluation of legally available water supplies, reservoir operational studies, delineation of flood plains, flood routing, sediment transport, and hydraulically-connected surface water/ground water systems. Mr. Lytle has also been involved in many surface water supply evaluations, including assessment of the legal and physical availability of water, surface storage siting, reservoir operational studies, assessment of containment transport via surface flows, and surface flow and water quality characterizations.

Experience in ground water modeling studies has included simulating the effects of large-scale well pumping on adjacent water users, simulating the potential suitability of an injection program for underground water storage with subsequent recovery by a pumping well, and simulating the potential for purging contaminants from alluvial and bedrock aquifers by the use of pump and treat systems. Mr. Lytle has also conducted several evaluations of surface water/ground water hydraulic interactions, including characterizations of hydraulic and water quality interactions in urbanized drainages and alluvial valley floor studies. This work has included the use of surface water/ground water interactive models.

PROJECT EXPERIENCE *(Continued)*

Recent projects have included the management of the surface and ground water modeling associated with an Environmental Impact Statement to construct an off-stream reservoir to provide new, renewable water supplies for a community in the southeastern Denver Metro area. These studies included the combined surface water/ground water modeling of the Cherry Creek stream system to assess hydrologic impacts and operational studies to evaluate the operational characteristics of the proposed reservoir. This work has resulted in the issuance of the first Section 404 permit for a water supply reservoir along the Front Range of Colorado in over 20 years.

Other recent work has involved the evaluation of alternative reservoir sites, selection of the preferred alternative, and operational studies to evaluate water supply availability for a proposed mine near Fairbanks, Alaska. These studies were conducted in support of obtaining a permit through the Alaska Department of Natural Resources.

Mr. Lytle has also been involved in many geohydrologic investigations, including the design and installation of monitoring well and ground water sampling programs, as well as ground water modeling. This experience has included predicting the movement of contaminants to the ground water table and in the ground water system, and the associated effects of contaminant movement in ground water with regard to health and safety issues and general water quality degradation. It has also included the installation of ground water monitoring networks to develop underflow and water quality data bases. This work has also included studies to evaluate the need to dewater portions of an aquifer to allow mining to continue unimpeded by inflows to a pit or underground workings.

Surface water hydrology studies have included extensive work in the mining industry, developing baseline flow and water quality data bases to define pre-mining conditions. Follow-up studies have typically been conducted to assist with mine closure and re-establishment of pre-mining hydrologic conditions.

Mr. Lytle has managed numerous water supply master planning efforts that have included evaluation of interim and long-term water supply development and management options. Key to all master planning efforts has been the orderly and economic development of options to provide the most efficient water supply delivery options. These studies have been completed for municipalities, special districts, and private sector clients. Mr. Lytle has been involved in the subsequent implementation of the recommendations from these master planning efforts.

Experience in Colorado water rights law has involved the permitting and adjudication process necessary for procuring water rights; Mr. Lytle has worked with water districts, developers and mining interests to help procure sufficient water rights for the projected water supply demand, and has been involved in the development and adjudication process for plans of augmentation for water

PROJECT EXPERIENCE *(Continued)*

districts and developers. Mr. Lytle has appeared as an expert witness in Water Court regarding the adjudication of nontributary water rights, direct flow surface water rights, storage rights, changes of use, changes of points of diversion, and augmentation plans, and has appeared as an expert witness in District Courts of Colorado regarding the value of Denver Basin ground water rights, surface water rights, surface storage rights, and gravel pit storage.

Expert testimony has been provided by Mr. Lytle in cases related to surface water flow and water quality issues relative to watershed characterization, runoff duration, hydraulic interaction between surface water and alluvial ground water, surface flow travel times, and the persistence of volatile organic compounds in the surface flow based on the flow and duration characteristics.

Mr. Lytle's experience includes extensive work with aquifer storage and recovery (ASR). Mr. Lytle managed the first ASR study in the Denver Basin at Parker, Colorado. Subsequently, Mr. Lytle helped develop the scope of work, and was the technical project manager, for a 6-year research and development project investigating deep well injection, storage and recovery of surface water supplies. This ASR project was funded through the U.S. Bureau of Reclamation as part of the High Plains States Groundwater Demonstration Program. As part of this work, Mr. Lytle assisted the State Engineer's Office with the drafting of the Denver Basin Extraction Rules, which were subsequently promulgated into law.

Mr. Lytle currently has responsibility for project management in the areas of hydrologic impact studies, environmental audits, ground water remediation programs, baseline surface and ground water data collection programs, surface- and ground- water supply development, surface water modeling studies, ground water modeling studies and water rights cases.

SELECT PUBLICATIONS

"Disposal of Domestic Wastewater Through the Use of Evaporation-Transpiration Beds", M.S. Thesis, University of Colorado at Boulder, May 1978.

"Artificial Recharge Demonstration Project, Denver Basin, Colorado", coauthored with K. Le and J. Halepaska, Proceedings of the International Symposium on Class V Injection Well Technology, Las Vegas, Nevada, September 1988.

"Artificial Recharge: Willows Experience, Willows Water District, Arapahoe Aquifer Recharge Project", co-authored with K. Le and J. Halepaska, Proceedings of Groundwater Engineering and Management Conference, Denver, Colorado, February 1990.

"Conjunctive Surface and Ground Water Use Through Deep Bedrock Aquifer Injection and Recovery", co-authored with K. Le, J. Halepaska, Proceedings of the 1993 AWRA - Colorado Section Annual Meeting.

SELECT PUBLICATIONS *(Continued)*

"Deep Bedrock Well Injection Near Denver, Colorado," Proceedings of the Second International Symposium on Artificial Recharge of Ground Water, Orlando, Florida, July 17-22, 1994.

"Conjunctive Use Program for the Front Range Using Deep Bedrock Injection, Storage and Recovery," Proceedings of the 1995 AIPG National Meeting, Denver, Colorado, October 1995.

"Conjunctive Use Program Using Deep Bedrock Injection Wells Near Denver, Colorado," Proceedings of the 1997 AWWA National Conference, Atlanta, Georgia, June 1997.

"What is the Useful life of the Denver Basin Aquifers?", co-authored with Dr. James R. Kunkel, Proceedings of the 2002 AWRA National Specialty Conference, Keystone, Colorado, July 2002.

"Case History of Feasibility Studies on Aquifer Storage and Recovery in the Denver Basin," paper included in the AEG Publication *Engineering Geology in Colorado: Contributions, Trends and Case Histories*, October 2003.

"Conversion of Municipal Water Supplies from Non-Renewable to Renewable Resources," Proceedings of the 2006 AWRA Summer Specialty Conference, Missoula, Montana, June 28, 2006.

"A Win-Win Scenario for Urban/Rural Water Supplies," The Water Report, Issue #48, February 15, 2008.