



PATRICIA K. FLOOD, P.E.
SENIOR ENGINEER

CURRENT Design and construction administration of water facilities, storm drainage facilities and water supply feasibility studies, water rights analysis, water rights, and facilities appraisals, for municipalities, special districts, and private industry.

EDUCATION B.S., Civil Engineering, 1974
University of Kansas

Graduate Work, Water Resources, 1976-78
University of Colorado

REGISTRATION Registered Professional Engineer—Colorado #20307
Certified General Appraiser—Colorado #CGO1318801

REPRESENTATIVE PROJECTS

Water and Wastewater Systems

Town of Buena Vista, Colorado. Planning, design, and construction services for wells, water treatment plant, pump station, water storage, water transmission lines, and distribution system. Review submittals for proposed subdivision.

Water Transmission and Distribution Pipelines for Industrial Plant, Commerce City, Colorado. Planning, design, and construction services for a water line to provide fire flow for a large industrial facility.

450-Unit Subdivision, Chaffee County, Colorado. Services included rehabilitation of an existing water system and master planning and design of improvements including wells, pump station, storage and distribution system.

Water Resource Planning for Boy Scouts. Prepared water resource master plan for the two Denver Area Council Boy Scout camps. Planning and design of water system to serve new Family Camp and design of individual wastewater disposal systems.

Water Supply and Facilities Planning. Analysis of existing and future water supply demands and planning of water supply facilities for a regional parks complex (Adams County, Colorado).

Water and Wastewater Alternatives Analysis. Engineering and economic feasibility study regarding water supply costs and the costs of wastewater effluent use for irrigation (Phoenix, Arizona).

Water Supply Alternatives. Evaluation, engineering feasibility, and economic analysis of various water supply alternatives available to the City of El Paso, Texas for the State of New Mexico in El Paso vs. New Mexico.

Municipal Diversion Dam and Pump Station. Design of diversion structure with fish ladder, high head (900 feet) pumping station, and pipeline. Preparation of 404 permit application, Pitkin County, Colorado.

Metropolitan District Service Plan. Preparation of a service plan report for the formation of a Special District to provide functions relative to water, sewer, parks and recreation, streets, and other metropolitan district statutory powers (Exxon, USA, Battlement Mesa, Colorado).

Pipe Failure Analysis. Determine cause of water line pipe failure by compiling fact situation and performing structural analysis of pipe.

Water System and Road Improvements. Feasibility study, service plan for special district formation, design, and construction administration for water system and roadway improvements (Aspen, Colorado).

Water Supply for Municipal and Mining Use. Design review of polyethylene pipeline material for a high head water supply pipeline and diversion and pump station facilities.

Buena Vista Airport. Design of spring collection system piping and piping of irrigation laterals with up to 30 feet of cover and location under airport runway.

Design and Construction of Sanitary Sewers. Initial planning, design, and construction observation for Sanitation District in Aspen, Colorado. Services included coordinating inflow/infiltration studies on sewer system and the design of repairs.

Design of Water and Wastewater Systems. Planning, design, and construction administration of wastewater collection systems, water distribution system, water storage tanks, and pump stations for Water and Sanitation District, Snowmass Village, Colorado.

Reservoirs

Expert Testimony on Reservoir Facility. Researched records and historic use and performed hydraulic analysis of reservoir in Denver metropolitan area. Provided expert testimony in District Court.

Capacity Analysis of Reservoir. Research and feasibility study of enlarging reservoir storage capacity and spillway improvements necessary to provide safe operating conditions (Arvada, Colorado).

Dam Outlet Modifications at Rocky Flats Environmental Technology Site. Design of dam outlet modifications for three reservoirs. Work included analysis of piping materials and control gates.

Water Rights

Substitute Water Supply Plans, South Platte River, Colorado. Preparation of substitute supply plans for a gravel mine operator with numerous plants along the South Platte River.

Quantification and Water Rights Application. Quantify groundwater for a 320-acre parcel near Parker, Colorado for water rights application.

Analysis of Groundwater Rights and Augmentation Plan. Quantification of groundwater rights for proposed subdivision near Elizabeth, Colorado.

Cache La Poudre Transfer. Analysis and evaluation of proposed City of Thornton application to transfer and exchange irrigation rights on Cache La Poudre to Thornton.

Evaluation of South Park, Colorado Ranch. Field inspection and analysis of a South Park ranch transferable consumptive use.

Kansas v. Colorado. Analysis and preparation of exhibits regarding the Arkansas River Winter Storage Program for Southeastern Colorado Water Conservancy District.

Water Transfer Plan. Assist in negotiations with protesters in water transfer and provide testimony (Buena Vista, Colorado).

Augmentation Plan and Water Source Planning. Water augmentation plan and water source evaluation for the city of Woodland Park, Colorado.

Diversion Dam and Irrigation Gates. Feasibility study, design, and construction supervision of irrigation diversion dam and dual headgate installation (two-75 cfs capacity) Encampment, Wyoming.

Drainage

Dickey Residence, Littleton, Colorado. Represented homeowner and prepared analyzed hydraulic capacity in a drainage dispute with neighboring residence (Arapahoe County District Court, 99CF1278).

Meadow Creek Homeowners Association, Lakewood, Colorado. Hired by homeowners' association to determine source of groundwater periodically flooding a residential unit.

High Pointe of Westminster Association, Westminster, Colorado. Design of drainage cures for localized drainage problems for a multifamily complex.

Sableglen Residences, Colorado Springs, Colorado. Prepared a design for drainage facilities for four residences where drainage problems occurred on a routine basis.

Denver Art Museum, Denver, Colorado. Designed building drainage improvements to alleviate occasional subsurface basement seepage in an area of new construction.

Wyndham Park, Arvada, Colorado. Represented the builder in a lawsuit with regard to surface and subsurface drainage deficiency issues at a multifamily development.

Multifamily Housing, Highway 36 in Adams County, Colorado. The Colorado Department of Highways improved Highway 36 in the north Denver area, which caused the blockage of historic drainage. Flooding of multifamily housing occurred. The problem was defined and solutions were proposed.

Kipling Sun Townhomes, Jefferson County, Colorado. Provided consulting services to homeowners association regarding floodplain insurance. Provided design and construction administration of drainage facilities for units adjacent to floodway.

Integrated Subsurface Building Drainage System for University of Southern Colorado, Pueblo, Colorado. Planning and design of subsurface drainage system, surface drainage, and landscape modifications to provide protection to campus housing and university buildings to avoid damaging of foundations, to avoid wet basements, and to minimize wetting of highly expansive soils. Materials analysis for subsurface drains at depths of 20 to 25 feet and surface drainage materials selection with consideration of alkaline soils.

Master Planning for Highline Canal. Performed stormwater master planning for future conversion of the Highline Canal in the Denver metropolitan area from irrigation use to recreation corridor.

Calahan Construction Drainage. Performed site investigation and drainage analysis related to building damage claims.

City of Black Hawk, Colorado. Reviewed plans, specifications, and site investigation of drainage facilities related to roadway construction.

Continental Homes, Douglas, County. Prepared design of a storm sewer outlet modification to minimize erosion of stream bank.

Town of Del Norte, Colorado. Prepared drainage master plan for town.

E-470 Drainage Special Benefits Analyses. Provided analyses of benefits to adjacent landowners due to construction of drainage facilities associated with construction of E-470 toll road.

Design Standards Denver International Airport. Prepared design standards for sanitary sewer, storm sewer and manholes for Denver International Airport. Standards included materials and structural analysis procedures for "airside and "landside" facilities.

Water, Sewer, and Drainage Master Planning. Water supply augmentation engineering report and conceptual design and engineering report on water, sewer, and drainage facilities for 6000-unit Regis-Maryvale, Inc. development project.

Pipe Materials Manual. Research, evaluation, economic analysis, and development of Technical Criteria for the use of various storm sewer pipe materials for the Urban Drainage and Flood Control District (Denver, Colorado metropolitan area).

Big Thompson River Channel Improvements. Analysis of flood water surface elevations and design of channel improvements to contain the 100-year flood within the channel.

Drainage Utility and Rate Study. Preparation of a rate study to equitably assess monthly fees to generate funds for construction, operation, and maintenance of a municipal drainage utility program (Longmont, Colorado).

Groundwater Subsurface Underdrain Criteria. Preparation of criteria for sizing, typical installation details, and outfall requirements for groundwater underdrains for the City of Longmont, Colorado.

Floodplain Study. Computer analysis of floodplain for Roaring Fork/Castle Creek confluence, Aspen, Colorado. Master plan for facilities to mitigate flood hazards.

Drainage Facilities and Access Road. Design of access road utilizing reinforced fill with subsurface drainage and design of roadway drainage and detention facilities for condominium project in Snowmass Village, Colorado.

Floodplain Analysis. Structural and hydraulic analysis of effect of fence placed in floodplain (Adams County, Colorado).

Appraisals and Valuations

Conservation Easement Appraisal Manual. Prepared a chapter on the appraisal of water rights associated with conservation easements for a Conservation Easement Handbook.

Appraisal of Denver Basin Groundwater and Tributary Water Rights. Prepared an appraisal for a bank of a portfolio of deep groundwater and tributary groundwater rights.

Appraisal of Irrigation Company Water Rights, Lower Arkansas River, Colorado. Performed an appraisal of direct flow and storage water rights of an irrigation company's shares for decision-making purposes related to conservation easements

Appraisal of Water Rights Portfolio for Denver Metro Area Homebuilder. Prepared an appraisal of a package of water rights, including storage capacity, on the south Platte River and South Boulder Creek and contract water for consumable effluent.

Appraisal of Colorado-Big Thompson Water and Seepage Water Right. Prepared a valuation for an industrial client of their water right assets to be included in their financial statement.

Appraisal of Water Rights, Summit County, Colorado. Performed appraisal of water rights to be donated as part of a conservation easement.

Valuation of Reservoir, Weld County, Colorado. Preparation of appraisal for a 1,750 acre-foot reservoir rehabilitation project for use by the Colorado Water Conservation Board as collateral.

Valuation Consultation for San Juan County Water Conservancy District. Performed audit and replacement cost new-less-depreciation analysis of the water system facilities and a reservoir of a private water company for potential acquisition.

Appraisal of Water Rights Associated with Oil Shale Project. Analysis of yield and market for absolute and conditional water rights in the Colorado River basin. Appraisal also included the valuation of an existing roller-compacted concrete dam.

Appraisal of Irrigation Water Rights in South Park, Colorado for Park County and Colorado Open Lands. Prepared appraisal of water rights, including reservoir yield, "with" and "without" a conservation easement.

Appraisal of Groundwater Rights in Southern Nevada. Review of yield of a portfolio of groundwater certificates in the Pahrump, Nevada area with an annual duty of 11,000 acre-feet. Provided follow-up testimony.

Yield of Analyses and Appraisal of Denver Basin Groundwater Rights. Analyze and prepare appraisal of 7,300 acre-feet of water rights south of the Denver metropolitan area.

Appraisal of Surface Water Rights, Lead, South Dakota. Analyze and appraise a Whitewood Creek surface right that was used for power generation, gold mining, and other uses.

Appraisal of Irrigation Water Right. Analyze yield and prepare an appraisal of a South Platte water right to be transferred to the Denver Botanical Gardens.

Appraisal of Transmountain Ditch in Rocky Mountain National Park. Analysis and appraisal of a transmountain ditch which was to be exchanged for Colorado Big Thompson Article 24 water. Appraisal prepared for National Park Service.

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Appraisal of Reservoir Storage Right and Reservoir Right-of-Way. Appraisal for National Park Service of reservoir interests located within Rocky Mountain National Park. The subject failed due to hydraulic piping with extensive property damage and loss of life.

Valuation of Denver Basin Groundwater. Provide opinion of value of 30,000 acre-feet of adjudicated but undeveloped groundwater underlying lands of State Land Board. Work included analysis of distribution and transmission pipeline costs.

Appraisal of Surface and Groundwater Water Rights for FDIC. Analyze and prepare appraisal of South Platte surface water rights and Denver basin groundwater for Federal Deposit and Insurance Corporation.

Firm Yield Analysis and Appraisal of Municipal Water Supply. Water supply and reservoir operations study to determine firm yield of City of Broomfield, Colorado system. Preparation of market value appraisal of water systems associated with reservoir.

Appraisal of Water Rights. Evaluation and appraisal of direct flow and reservoir storage rights in North Platte River basin.

Yield Analysis and Appraisal of Yampa River Water Rights. River operation study of Yampa River in northwest Colorado to determine average and dry year yield. Preparation of appraisal of water rights.

Appraisal of Groundwater Rights in Eastern Colorado. Review of rights in a designated groundwater basin and preparation of an appraisal.

Appraisal of Water Farm Project. Preparation of appraisal of water farm project in western Arizona adjacent to the Central Arizona Project Canal.

Water Rights Acquisition Study. An analysis of current water rights and recommendations for purchase of additional water rights to meet future industrial demands on Clear Creek.

Appraisal of Water Rights. Evaluation and economic analysis of water rights transaction for industrial client in Denver, Colorado metropolitan area.

Miscellaneous Engineering Services

Cliff Stability Analysis. Consultation with State Geologist and preliminary design of drainage improvements and erosion protection/retaining wall on 40-foot cliff.

Water Quality Mitigation Plan. Preparation of plan to mitigate water quality impacts and supporting documentation for 404 permit application for proposed ski area development (Eagle County, Colorado).

Geothermal Well Utilization. Design of arthritis research clinic facilities utilizing geothermally heated natural mineral water. Water rights analysis and augmentation plan (Carbondale, Colorado).

OTHER EXPERIENCE

Partner, Flood & Flood Consulting Engineers, Aspen, Colorado. Project management and design of water resource and civil engineering projects.

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Design Engineer, Wright-McLaughlin Engineers. Aspen and Denver, Colorado, feasibility, and design of water, wastewater, and drainage facilities.

Design Engineer, Bucher & Willis Consulting Engineers, Salina, Kansas. Design of concrete structures and bridges.

PROFESSIONAL & HONORARY SOCIETIES

American Water Works Association

Tau Beta Pi

Chi Epsilon

PUBLICATIONS/PRESENTATIONS

Nichols, P.D., M.F. Browning, K.R. Wright, P.K. Flood, and M.S. Weston. 2005. "Water Rights Handbook For Colorado Conservation Easements". Colorado Water Trust for Conservation Organizations, Funded by Great Outdoors Colorado. Publication Pending.

Flood, P.E. 2003. Valuation of Water Interests in a Takings Context – CLE International Regulatory Takings, Denver, Colorado. June 9.

Flood, P.K. and K.R. Wright. 2003. Valuation of Water Rights CLE International Colorado Water Law, Denver, Colorado. March 29.

Flood, P.K. and K.R. Wright. 1998. *Water Rights of the Eastern United States*. American Water Works Association.

Flood, P.K., K.R. Wright, and D. Freeman. 1998. The Eastern Water Manager's Guide to Water Rights. *Proc., American Water Works Association, Annual Conference, Dallas, TX*. June 21-25.

Flood, P.K. and K.R. Wright. 1998. Eastern Water Rights Engineering: The Role of the Hydrologist. *Proc. American Water Works Association, Annual Conference, Dallas, TX*. June 21-25.

Flood, P.K. 1996. Water Allocation Using the Efficient Marketplace. *Proc. from the USCID Water Management Conference*, Las Vegas, Nevada. December 5-7.

Flood, P.K. 1990. Water Rights of the 50 United States and Possessions. *Water Rights Handbook*. American Water Works Association.

Flood, P.K. 1987. Water Management Decision Support Using CADD. Paper presented at 3rd Water Resources Operation and Management Workshop, Colorado State University, sponsored by ASCE.

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EXPERT WITNESS TESTIMONY

Deposition on behalf of Lincoln County in Case 98CV6, Lincoln County, Colorado. Rodney J. Preisser v. Board of County Commissioners of Lincoln County, et al. October 2005.

Deposition regarding Case No. A455945, Dept. No. 20, District Court, Clark County, Nevada. Commercial Federal Bank, FSB, v. Lee Kapaloski; Parsons Behle & Latimer et al. 2005.

Deposition regarding Case No. 96CW313, Water Division 4, for Objectors Telluride Ski Company and Mountain Village Metropolitan District to the Application of the Town of Telluride and Idarado Mining Company. October 2002.

Eagle River Water & Sanitation District, Upper Eagle Regional Water Authority, and Vail Associates v. Town of Minturn: Deposition taken regarding Town of Minturn water rights. 1998.