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*Attorneys for A&B Irrigation District, Burley  
Irrigation District, Milner Irrigation District,  
North Side Canal Company, Twin Falls Canal  
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**FLETCHER LAW OFFICE**  
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*Attorneys for American Falls Reservoir  
District #2 and Minidoka Irrigation  
District*

**IN THE DISTRICT COURT OF THE SIXTH JUDICIAL DISTRICT OF THE  
STATE OF IDAHO IN AND FOR THE COUNTY OF POWER**

ABERDEEN-SPRINGFIELD CANAL  
COMPANY, an Idaho Corporation, JEFFREY  
and CHANA DUFFIN, individually, as  
stockholders, and as husband and wife,

Plaintiffs,

vs.

IDAHO DEPARTMENT OF WATER  
RESOURCES, an executive department of the  
State of Idaho,

Defendant.

Case No. CV-2014-165

**SURFACE WATER COALITION'S  
DISCLOSURE OF WITNESSES**

COME NOW, A&B Irrigation District, American Falls Reservoir District #2, Burley  
Irrigation District, Minidoka Irrigation District, Milner Irrigation District, North Side Canal  
Company and Twin Falls Canal Company (hereafter collectively "Surface Water Coalition",  
"Coalition", or "SWC"), by and through their attorneys of record, and in compliance with the

Court's *Stipulation for Scheduling and Planning*, dated August 12, 2014, hereby discloses the following witnesses which may be called by the Coalition at trial:

**Lay Witnesses**

Idaho Department of Water Resources ("IDWR")

*Those IDWR Agents who participated in the review and recommendation process for a well driller's permit sought by Aberdeen Springfield Canal Company for the alleged recovery of irrigation water.*

*IDWR agents participating in the Notice of Violation process for Jeffrey and Chana Duffin, KBCP, LLC and Lance Funk.*

*Agents may include, but are not limited to, Tim Luke and Robert Whitney.*

Gary Spackman, Director  
Idaho Department of Water Resources  
322 E. Front Street  
Boise, ID 83720

*Testimony will include the policies of the Department of Water Resources regarding the permitting and/or use of recovery wells.*

**Expert Witnesses**

Charles E. Brockway  
Charles G. Brockway  
Erick Powell  
Brockway Engineering, PLLC  
2016 Washington St. North, Suite 4  
Twin Falls, ID 83301

*Testimony from these witnesses will include a discussion of hydrology in the ASCC service area, including canal seepage and groundwater diversion and flow data and results of groundwater modeling. The witnesses will be paid as expert witnesses in these proceedings consistent with their regular rate and charges, ranging from \$120 to \$253 per hour. Additional information, including a CV, is attached hereto.*

David Shaw  
ERO Resource Group  
4001 E. Main Street  
Emmett, ID 83617

*Testimony will include historical application of Idaho Code § 42-228. Additional information, including a CV, is attached hereto.*

Dan Temple  
A&B Irrigation District  
414 11<sup>th</sup> Street  
Rupert, ID 83350

*Testimony will include well construction and operation. Mr. Temple is not being compensated for operating expert testimony in this case over and above what he is already paid to perform his regular duties as Manager for A&B. Mr. Temple has not authored any articles in the last 10-years. Mr. Temple has not testified as an expert in any cases in the last 4-years.*

The Coalition reserves the right to call any witnesses identified by any other party to these proceedings.

The Coalition reserves the right to supplement this disclosure of law and expert witnesses in compliance with the Idaho Rules of Civil Procedure and the Court's scheduling order.

**DATED** this 14<sup>th</sup> day of January, 2015.

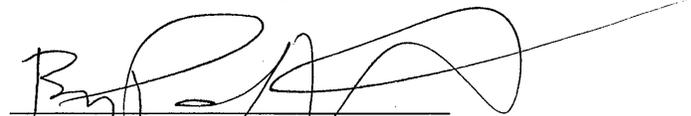
**BARKER ROSHOLT & SIMPSON LLP**



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*Attorneys for A&B, BID, Milner, NSCC, TFCC*

**FLETCHER LAW OFFICE**



W. Kent Fletcher

*Attorneys for American Falls Reservoir  
District #2 and Minidoka Irrigation District*

**CERTIFICATE OF SERVICE**

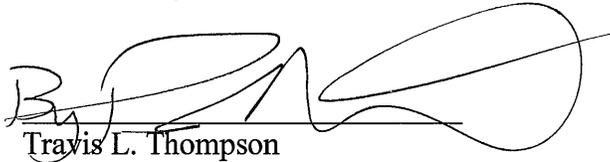
I HEREBY CERTIFY that on the 14<sup>th</sup> day of January, 2015, I served true and correct copies of the foregoing upon the following by the method indicated:

Garrick Baxter  
John Homan  
Meghan Carter  
Deputy Attorneys General  
Idaho Department of Water Resources  
P.O. Box 83720  
Boise, Idaho 83720-0098

U.S. Mail, Postage Prepaid  
 Hand Delivery  
 Overnight Mail  
 Facsimile  
 Email

Randy Budge  
Carol Tippi Volyn  
Racine, Olson, Nye, Budge & Bailey,  
Chartered  
P.O. Box 1391  
Pocatello, Idaho 83204-1391

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Travis L. Thompson

# Charles E. Brockway, P.E., Ph.D.

**Brockway Engineering**  
**2016 North Washington St. Suite 4**  
**Twin Falls, ID 83301**

(208) 736-8543

(208) 736-8506 FAX

E-mail: charles.e.brockway@brockwayeng.com

## Present title:

**Senior Member** – Brockway Engineering P.L.L.C

**Formerly-Research Professor** – Civil and Agricultural Engineering: Supervision of research conducted by the University Water Resources Research Institute and the College of Engineering at Kimberly, Idaho. Graduate student supervision and directed studies instruction in Water Management and Water Resources related subjects.

**Associate Director** – Idaho Water Resources Research Institute

## Summary of education beyond high school:

### Institution, Degree, Year

University of Idaho 1955-1959, B.S.-Civil Engineering, 1959

California Institute of Technology 1959-1960, M.S. – Civil Engineering, 1960

University of Colorado, Denver, Colorado, Management, 1963

University of Denver; Denver, Colorado, Civil Engineering, 1964

Utah State University, Ph.D.-Water Resources Engineering, 1977

## Years of service on U of I Faculty: 32

Date of original appointment: 1965

Dates of advancement in rank:

Associate Research Professor: 1974

Professor – 50% Agricultural Engineering, 50% Civil Engineering: 1978

## Subjects and courses taught:

CE 500, CE 600, CE 502

## Summary of academic experience:

University of Idaho – Research Professor–Civil and Agricultural Engineering, 1978

University of Idaho – Associate Research Professor, Civil Engineering, 1974-1978

University of Idaho – Assistant Research Professor, Civil Engineering, 1965-1974

Boise College – Instructor in Engineering, 1961-1963

## Summary of other experience:

Senior Member, Brockway Engineering P.L.L.C. Water Resources Engineering

University of Idaho – USAID Pakistan Project on Irrigation Systems Management Research, 1984

U.S. Bureau of Reclamation – Hydraulic Research Laboratory, Denver, Colorado – Hydraulic Research Engineer, 1963-1965

U.S. Bureau of Reclamation – Boise, Idaho – Hydraulic Engineer, 1961-1963

Converse Foundation Engineering, Inc. – Pasadena, California – Foundation Engineer, 1960-1961

California Institute of Technology – Pasadena, California – Assistant Project Engineer,  
U.S. Public Health Services Research Project, 1959-1960

**Partial Client List:**

**Twin Falls Canal Company** – Hydrology and water use  
**North Side Canal Company** – Hydrology and water use  
**Micron Technology** – Ground water and water supply  
**J.R. Simplot Company** – Land disposal of processing waste, water supply, water rights  
**City of Twin Falls, ID** – Water supply and hydrology  
**Idaho Trout Processors** – Hydraulics and water supply  
**Cedar Mesa Reservoir and Canal Co** – Water Management Consultant  
**Clear Springs Trout Company, ID** – Water supply and distribution systems, expert testimony  
**Idaho Power Company** – Relationships of groundwater and surface water – Upper  
**Snake River Basin** – Water right adjudication  
**Idaho Department of Fish and Game** – Evaluation of groundwater/stream relationship for litigation – Parma vicinity  
**Blaine County, ID** – Waste disposal systems for high-density rural subdivisions  
**City of Mountain Home, ID** – Water Rights, hydrologic analysis, expert testimony  
**Rinker Company, CA** – Hydrology, water rights  
**U.S. Bureau of Reclamation (was Maricopa County Water District)** – Arizona Flood Study, expert testimony  
**Office of Technology Assessment (U.S. Congress)** – Irrigation Distribution Systems  
**U.S. Department of Justice** – Indian Water Rights, expert testimony  
**Montgomery Engineers** – Ground water quality evaluations  
**J.U.B. Engineers, ID** – Groundwater and hydraulics  
**Amalgamated Sugar Company, ID** – Hydrology and waste disposal  
**Pioneer Irrigation District, ID** – Water rights and hydrology, urbanization impacts on canal companies  
**Aries Development Co.** – Subdivision water rights  
**Eagle View Farms, ID** – Water rights and irrigation system  
**Rim View Trout Company, ID** – Hydraulics  
**Surface Water Coalition** – Canal Company water requirements, project water management, water rights.  
**Clear Springs Foods, Inc., ID** – Aquaculture water use, hydrology, hydraulics and water rights  
**Heart Rock Ranch, ID** – Water Rights, rehabilitation of streams, irrigation water requirements, wildlife, recreation, river restoration and management  
**Valley Club, ID** – Irrigation water requirements, aquifer recharge evaluations, groundwater modeling  
**Idaho Water Company** – Water Rights, transfers, groundwater modeling  
**Silver Springs Ranch, ID** – Stream renovation, irrigation water requirements, diversion systems

**Registered Professional Engineer:**

Idaho and Washington

**Special Awards or Honors:**

Honorary Membership ASTM, 1959

U.S. Army National Defense Transportation Award, 1958  
Distinguished Military Graduate – University of Idaho  
Top Ten Graduating Senior – University of Idaho, 1959  
No. 2 in graduating class of 889, University of Idaho, 1959  
Representative of USBR Division of Research at 1963 Intergovernmental Training Program, Denver, 1964  
Scholarship – University of Denver, Graduate School of Management, 1964  
National Science Foundation Fellowship – Utah State University, 1967-1968  
Outstanding Young Engineer Award for Idaho, National Society of Professional Engineers, 1968  
Engineer of the Year, 1997 American Society of Agricultural Engineers  
Idaho Water Users Hall of Fame - 1998

**Membership in professional and scholarly organizations:**

National Society of Professional Engineers, 1967- present  
Idaho Society of Professional Engineers, 1967- present: President 1978  
American Society of Civil Engineers – Irrigation & Drainage Division Committee  
Chairman:  
1.) Operation and Maintenance of Irrigation and Drainage Systems, 1975-1981  
2.) Water Quality Committee, 1980-1984, Chairman  
3.) Task Committee on Guidelines for Erosion and Sediment Control in Irrigated Agriculture, 1980-1983, Chairman  
4.) Publications Committee, 1985-1992  
Research Society of America  
National Council of Examiners for Engineering and Surveying, 1981-1991  
Idaho Board of Professional Engineers and Professional Land Surveyors, 1981-1991, Chairman  
American Water Resources Association

**Offices held in such organizations:**

National Society of Professional Engineers  
Member – Young Engineers Committee, 1973-1974  
Chairman – Young Engineers Committee, 1975-1977  
Member – President's Committee on Board of Directors Organization, 1977  
Member – Registration and Qualification for Practice Committee, 1979-1981  
Chairman – Registration and Qualification for Practice Committee, 1982-1984  
Member – Participating Organizations Liaison Committee to NCEE, 1982-1984  
Idaho Society of Professional Engineers, President 1978  
President - Magic Valley Chapter, 1970-1971  
Member – State Ethical Practices Committee, 1966-1977  
Member – State Intersociety Relations Committee, 1968  
Member – State Nominating Committee, 1975-1976  
Member – Board of Directors, 1972-1973  
Member – Board of Directors, Past President Chairman – Nominating Committee 1979  
State Director – Representative for Idaho NSPE, 1982-1983  
Nominating Committee for Idaho Board of Professional Engineers & Land Surveyors Member  
American Society of Civil Engineers

Member – Operation and Maintenance of Distribution Systems Committee  
Irrigation and Drainage Division, 1975-1981  
Chairman – Irrigation and Drainage Division, Operations and Maintenance  
Committee, 1977-1979  
Member – Water Quality Committee, Irrigation and Drainage Division, 1980-1984  
Chairman – Water Quality Committee, Irrigation and Drainage Division, 1982-  
1984  
Member – Task Committee on Water Measurement, 1980-1983  
Chairman – Task Committee on Guidelines for Erosion and Sediment Control in  
Irrigated Agriculture, 1984 – Present  
Member – Publications Committee, 1985 – Present  
Corresponding Member – ASCE irrigation and Drainage Division Committee on  
Operation and Maintenance of Irrigation Systems  
Reviewer – ASCE Irrigation and Drainage Division Committee on Publications  
Idaho Board of Professional Engineers and Land Surveyors Member, 1981  
Vice Chairman, 1983-1984  
Chairman, 1984-1986, 1990-1992  
National Council of Engineering Examiners  
Assistant Vice President, Western Zone  
Member, Professional Examinations Advisory Committee  
Member, Committee on Uniform Procedure and Legislative Guidelines, 1984  
Member, Communications and Publications Committee, 1983  
Member, Uniform Examinations and Qualifications Committee, 1984 – 1986  
Member, Committee on Examination Policies and Procedures, 1987 – 1989  
Member, Advisory Committee on Council Activities, 1986-1987  
Assistant Vice President – Western Zone, 1986-1987  
Member, Fundamentals Examination Review Committee, 1986 1988

### **Scholarly and creative activity:**

#### **Research:**

Development of systems analysis procedures for optimization of irrigation system designs with environmental, physical, and social constraints.  
Evaluation of crop consumptive use, irrigation requirements, and methods of determining basin depletion from agricultural development  
Systems analysis of water use to develop mathematical methods for studying complex ground water-surface water systems – mathematical modeling of aquifers,  
Ground water quality and river system water quality evaluations for nutrient load determination and river system modeling.  
Development of guidelines for design of sediment removal facilities for on-farm and irrigation distribution system waste ways  
Evaluation of attainable impacts on water quality of irrigation return flows due to implementation of best management practices for sediment and nutrient control.  
Evaluation of alternate energy sources for irrigation and municipal needs in Idaho.  
Analysis of operation and maintenance cost of water distribution systems and determination of the relationship of costs to known physical and organizational parameters and water use efficiency.  
Evaluation of the economic potential for use of geothermal hot water and steam in Idaho,

Study of the movement of water from canals to local water tables under saturated and partially saturated conditions.

Studies of the mechanisms of microbial action, sedimentation and soil-water-chemical interactions involved in natural sealing phenomenon in canals and reservoirs,

Evaluation of irrigation management practices for sustained land disposal of geothermal fluids.

Evaluation of practices and systems for controlling sediment and other pollutant losses from irrigated lands.

Investigation of the response of aquifer systems to changes in recharge or withdrawal due to change in land use.

Evaluation of procedures for estimating crop water requirements,

Development of cost effective procedures and equipment for measurement of irrigation diversions and power use in open and closed systems

### **Community services and other relevant activities:**

Member – Intermountain District Church of the Nazarene; Camps Board – 1976-1984,  
Board of Church Properties – 1976-1979

Member and Vice President, Twin Falls Reformed Church Consistory 2000-Present

Member – Twin Falls City Planning and Zoning Commission 12/1978-9/1979

Member – College of Southern Idaho Geothermal Energy Commission

Member – Governor's Committee on Energy Use – 1980-1981

Member – Idaho Technical Advisory Committee for Sediment in Surface Water

Chairman – Snake River Technical Advisory Committee – Idaho Legislative Council,  
1983-1985

Advisor – Governor's Snake River Advisory Committee – 1985

Member – Water Resources Foundation Board of Directors – 1985

Chairman – Idaho Technical Committee of Hydrology

Member – Idaho Department of Health & Welfare Sediment Criteria Committee

Member – Snake Plain Advisory Committee of Idaho Department of Health & Welfare

Member – Idaho Water Users Water Quality Committee – 1980

Member – INEL Dose Evaluation and Risk Assessment Committee

Member – Columbia River System Operations Review

Member – Mid Snake River Nutrient Management Advisory Committee

Member - Mid Snake River Irrigation Water Quality Coordination Committee

Technical Advisor – Middle Snake River Committee

Member – Liaison Committee, U.S. Geological Survey National Water Quality  
Assessment Program, Snake River Basin

Member – Snake River Studies Committee, Idaho Department of Water Resources

Member – City of Twin Falls Wellhead Protection Committee

Member-Eastern Snake River Plain Groundwater Modeling Committee

### **Publications:**

Brockway, C.E. 1964. Progress Report – Investigation of a Seepage Meter Designed by  
the Agricultural Research Service – Lower Cost Canal Lining Program, Bureau of  
Reclamation Hydraulic Branch HYD-529

Brockway, C.E. 1964. Flow Resistance Coefficients of Three Sizes of Cast-in-Place  
Concrete Pipe. Bureau of Reclamation Hydraulic Branch, HYD-533, 1964

- Brockway, C.E. 1965. Investigation of the Effect of Turnout Geometry on the Registration Accuracy of a Propeller-Type Open Flowmeter Bureau of Reclamation, HYD-545, 1965
- Brockway, C.E. 1966. Groundwater Investigations and Canal Seepage Studies. Engineering Experiment Station, University of Idaho, Progress Report No. 1, 1966.
- Schuster, J.C. and C.E. Brockway. 1967. Investigation of a 4-Inch Magnetic Flowmeter. Bureau of Reclamation, HYD-574
- Worstell, R.V. and C.E. Brockway. 1967. Estimating Seasonal Changes in Irrigation Canal Seepage. Presented at Spokane, Washington October 20, 1967.
- Worstell, R.V. and C.E. Brockway. 1967. Groundwater Investigations and Canal Seepage Studies. Engineering Experiment Station, University of Idaho, Progress Report No. 2
- Bloomsburg, G.L. and C.E. Brockway. 1968. Movement of Water from Canals to Groundwater Tables. Research Technical Completion Report, Idaho Water Resources Institute.
- Worstell, R.V. and C.E. Brockway. 1968. Field Evaluation of Seepage Measurement Methods. Presented at 2<sup>nd</sup> Seepage Symposium, Phoenix, Arizona February 1968.
- Bondurant, J.A., C.E. Brockway, and R.V. Worstell. 1968. Plastic Casings for Soil Cores. Soil Science, Vol. 107 No. 1
- Herbig, A.E. and C.E. Brockway. 1970. Operations and Maintenance Costs of Irrigation Distribution Systems. Proceedings, National Irrigation Symposium, Lincoln, Nebraska
- Bondurant, J.A., C.E. Brockway and R.V. Worstell. 1971. Systems Analysis of Irrigation Water Management in Eastern Idaho. Progress Report No. 1, University of Idaho Engineering Experiment Station
- Brockway, C.E. 1971. What Does It Cost to Operate an Irrigation District Proceedings, Fifth Regional Water Users' Conference, Bakersfield, California
- Bondurant, J.A., R.V. Worstell, and C.E. Brockway. 1972. Water Resources Management in the Upper Snake River Valley. Proceedings, Irrigation & Drainage Division, Specialty Conference, ASCE, Spokane, Washington
- Nicholas, C.R., Warnick, and C.E. Brockway. 1972. Geothermal Water and Power Resources Exploration and Development for Idaho. Research Technical Completion Report, University of Idaho, Idaho Water Resources Research Institute, Moscow, ID
- Brockway, C.E. 1972. Estimating Irrigation Distribution System Operation and Maintenance Costs. Paper presented at the Annual Meeting, Pacific Northwest Region ASAE, Calgary, Alberta, Canada, October 10-12, 1972.

Bondurant, J.A., R.V. Worstell, and C.E. Brockway. 1973. Implications of Changes in Water Management in the Upper Snake River Basin. Paper presented at the ASCE Water Resources Conference, Washington, D.C., January, 1973

Brockway, C.E. 1973. Investigation of Natural Sealing Effects in Irrigation Canals, Research Technical Completion Report, Project A-023-IDA, Idaho Water Resources Research Institute

Reese, D.L. and C.E. Brockway. Operation and Maintenance Cost on Irrigation, Distribution Systems, Progress Report, University of Idaho, College of Engineering

De Sonneville, Jos L.J. and C.E. Brockway. 1973. Systems Analysis of Irrigation Water Management in Eastern Idaho. Research Technical Completion Report, Project B-018-IDA, University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Reese, David L., H.F. Mayland, and C.E. Brockway. 1973. Alternative Methods of Estimating Snow Water Parameters. Water Resources Research, Vol. 9 No. 5

Bondurant, J.A. and C.E. Brockway. 1974. Operation and Maintenance Cost on Irrigation Distribution Systems. Proceedings, VIIIth International Congress of Agricultural Engineering, Flevohof, Netherlands

Bondurant, J.A. and C.E. Brockway. 1974. Sediment Ponds Clean Irrigation Runoff Water. Idaho Farmer.

Brockway, C.E. 1974. Water Resources of the Upper Snake River Basin, Proceedings, National Environmental Research Park Symposium, Idaho Falls, Idaho.

Watts, F.J., C.E. Brockway, and A.E. Oliver. 1974. Analyses and Design of Settling Basins for Irrigation Return Flow. Research Technical Completion Report, Project A-042-IDA, University of Idaho, Idaho Water Resources Research Institute, Moscow, ID

Warnick, C. and C.E. Brockway. 1974 Hydrology Support Study, A Case Study of Federal Expenditures on a water and Related Land Resource Project. Boise Project, Idaho and Oregon Project C-4202. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway, C.E. 1975. Energy Plant Siting Position Paper, Idaho Society of Professional Engineers February, 1975 (Member of Committee on Energy Plant Siting).

Bondurant, J.A., M.J. Brown, and C.E. Brockway. 1975 Some Aspects of Sedimentation Pond Design. Proceedings, National Symposium on Urban Hydrology and Sediment Control, Lexington, Kentucky

Brockway, C.E. 1975. Issues Involved in Peoples Choices in Resources-Water. Idaho Academy of Science, Caldwell, ID.

Brockway, C.E. 1975. Science in Idaho's Future, Idaho Academy of Science, Panel Symposium

- Claiborn, B.A. and C.E. Brockway. 1975. Impact of Changes in Irrigation Water Management in Eastern Idaho. Research Technical Completion Report, Project A-040-IDA, University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Bondurant J.A., C.E. Brockway, and M.J. Brown. 1976. Characterizing Irrigation Return Flow Streams. 7<sup>th</sup> U.S. Technical Conference and 10<sup>th</sup> ICID Congress.
- Brockway, C.E. 1977. Vegetative Buffer Strips for Sediment Retention in Irrigation Runoff. Proceedings, ASCE irrigation and Drainage Division Specialty Conference on Water Management for Irrigation and Drainage, Reno, Nevada
- Brockway, C.E. 1977. Sediment Ponds for Irrigation Return Flow and Potato Fresh Pack Effluent. Research Technical Completion Report, Project A-042-IDA. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Fitzsimmons, D.W., G.C. Lewis, J.R. Busch, G.M. McMaster and C.W. Berg. 1977. On-Farm Methods for Controlling Sediment and Nutrient Losses. Proceedings, National Conference on Irrigation Return Flow Quality Management, Fort Collins, Colorado.
- Brockway, C.E. 1977. Investigation of Natural Sealing Effects in Irrigation Canals. Ph.D. Dissertation, Utah State University.
- Brockway, C.E. and K.P. Grover. 1977. Water Management and Groundwater in the Henry's Fork-Upper Snake River Basin of Idaho. Research Technical Completion Report, ASCE Henry's Fork Project, Idaho Water Resources Research Institute.
- Bondurant, J.A., M.J. Brown and C.E. Brockway. 1977. Predicting Irrigation Return Flow Rates. ASAE-SW-192.
- Claiborn, Brent and C.E. Brockway. 1977. Predicting Attainable Irrigation Efficiencies. ASCE.
- Grover, K.P. and C.E. Brockway. 1978. Evaluation of Urbanization and Changes in Land Use on the Water Resources of Mountain Valleys. Research Technical Completion Report. Project B-038-IDA. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Robbins, C.W. and C.E. Brockway. 1978. Irrigation Water Salt concentration Influences on Sediment Removal by Ponds. Soil Sci. Soc. Am. J. 42:478-481.
- Longley, T.S., C.E. Brockway, and E.C. Larsen. 1978. Low Energy Sprinkler Equipment. ASAE Annual Meeting, Spokane, Washington. PN-78-406.
- Brockway, C.E. 1978. Systems Analysis of Irrigation Water Use in Eastern Idaho. OWRT.
- Brockway, C.E. 1978. Alternative Irrigation Systems for Flood Damaged Irrigation Lands Below Teton Dam. Research Technical Completion Report, Idaho Water Resources Research Institute.

- Busch, J.R., R.G. Allen and C.E. Brockway. 1978. Irrigation Rehabilitation Plans in the Teton Flood Area. ASCE Convention and Exposition, Chicago, Illinois.
- Allen, R.G., J.R. Busch, and C.E. Brockway. 1979. Optimal Irrigation Systems Subject to Available Resources Constrains. IX Congress CIGR 1979.
- Brockway, C.E. 1979. Relationship of Costs and Water-Use Efficiency for Irrigation Projects in Idaho. Research Technical Completion Report, University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Brockway, C.E. 1979. Effects of Changing Irrigation Efficiencies on Water Supplies. ASCE irrigation and Drainage Division Specialty Conference. Albuquerque, New Mexico.
- Brockway, C.E. 1979. Snake Plain Aquifer Model Studies. Idaho's Water, September 1979. Vol. 6 No. 4
- Brockway, C.E., editor. 1980. Manual on Operation and Maintenance of Irrigation and Drainage Districts, American Society of Civil Engineers, prepared by Committee on Operation and Maintenance of Irrigation and Drainage Division.
- Allen, R.G. and C.E. Brockway. 1980. Problems in Developing and Applying an Optimal Irrigation Plan. ASCE Journal of the Water Resources Planning and Management Division, Vol. 106 No. WR 1.
- Mayland, H.F. and C.E. Brockway. 1980. Frequency Analysis of Western Snow Data. Proceedings. 1980 ASCE Watershed Management Symposium. Boise, Idaho.
- Robinson, C.W. and C.E. Brockway. 1980. Vegetal Filters for Controlling Sediment in Irrigation Return Runoff. Proceedings. 1980 ASCE Irrigation and Drainage Division Specialty Conference. Boise, Idaho.
- Busch, J.R. and C.E. Brockway. 1980. Systems Approach to Irrigation Planning Research. 1980 ASCE Irrigation and Drainage Specialty Conference, Boise, Idaho.
- Brown, M.J., C.E. Brockway, and J.A. Bondurant. 1981. Ponding Surface Drainage Water for Sediment and Phosphorus Removal. Transactions ASAE, Vol. 24, No. 6 pp. 1478-1481.
- Brockway, C.E. and R.G. Allen. 1982 Impact of the Energy Crisis on Irrigation and Drainage, Part IV: System Design and Management Practices to Reduce Energy Requirements and Consumption. Paper Presented at the 9<sup>th</sup> Congress of the International Committee on Irrigation and Drainage, National Conference. Jackson, Mississippi.
- Everts, Chris and C.E. Brockway. 1982. Reducing Soil Losses with Filter Strips. Current Information Series No. 587 University of Idaho College of Agriculture. January 1982.
- Luttrell, S.P. and C.E. Brockway. 1982 Impacts of Individual On-Site Sewage Disposal Facilities on Mountain Valleys – Phase I. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Wells, R., C.E. Brockway, and J.R. Busch. 1983. Management, Maintenance and Operation of Pump Supplied Irrigation Resources Projects. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow ID.

Freeman, G., C.E. Brockway, and R.G. Allen. 1983. Management and Systems for Water and Energy Savings, Bruneau Proj, Idaho. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Allen, R.G., C.E. Brockway, and J.L Wright. 1983. Weather Station Siting and Consumptive Use Estimates. Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers.

Allen, R.G. and C.E. Brockway. 1983. Estimating Consumptive Irrigation Requirements for Crops in Idaho. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Allen, R.G. and C.E. Brockway. 1983. Weather and Consumptive Use in the Bear River Basin, Idaho During 1982. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Allen, R.G. and cb31983. Operation and Maintenance Costs and Water Use by Idaho Irrigation Projects. Proceedings of the 1983 Specialty Conference, Irrigation and Drainage Division, American Society of Civil Engineers, Jackson Hole, Wyoming.

Allen, R.G. and C.E. Brockway. 1983. Estimating Consumptive Use on a Statewide Basis. Proceedings of the 1983 Specialty Conference, Irrigation and Drainage Division, American Society of Civil Engineers, Jackson Hole, Wyoming.

Johnson, G.S. and C.E. Brockway. 1983. Users Manual for University of Idaho Ground-Water Flow Model and Recharge Program. Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Johnson, G.S., C.E. Brockway, and S.P. Luttrell. 1984. Application of a numerical Ground-Water Flow Model to the Mud Lake Area in Southeastern Idaho. Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Johnson, G.S., C.E. Brockway, and S. Ramseyer. 1984. Water Resource References for the Snake River Basin above Swan Falls. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Luttrell, S.P. and C.E. Brockway. 1984. Impacts of Individual On-Site Sewage Disposal Facilities on Mountain Valleys – Phase II – Water-Quality Considerations. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Robison, C.W., C.E. Brockway, C.W. Robbins, and G.S. Johnson. 1984. Evaluation of Irrigation Management Procedures for Geothermal Effluent. Completion Report, university of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Fitzsimmons, D.W. and C.E. Brockway. 1984. Irrigation Systems Management Research Design. Final Report submitted to USAID/Pakistan under Contract No. 391-0467-C-00-4028 prepared by Research Definition Team in Cooperation with Washington State University and Development Alternatives, Inc. University of Idaho, Moscow, ID. 354 p.

Johnson, G.S., C.E. Brockway, J.L. Wright, and A.L. Coiner. 1984. Remote Sensing for Irrigated Crop Water Use Phase I. Technical Completion Report, Idaho Water Resources Research Institute, submitted to NASA-Ames Research Center.

Johnson, G.S., C.E. Brockway, and A.L. Coiner. 1985. Evaluation of Methods for Estimation of Aquifer Recharge from Precipitation on Semi Arid Lands. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway, C.E. and G.S. Johnson. 1985. Calibration of the Snake Plain Aquifer Ground-Water Flow Model. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Johnson, G.S., C.E. Brockway, and S.P. Luttrell. 1985. Ground-Water Model Calibration for the Henry's Fork Recharge Area. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway, C.E. 1986. Remote Sensing for Crop Water use. Presented at Idaho Potato School January 29, 1986, Pocatello, Idaho.

Robinson, C.W. and C.E. Brockway. 1986. Modeling Erosion and Sedimentation in Irrigation. Presented at ASCE Water Forum '86. At Long Beach CA, August 1986.

Brockway, C.E. 1987. Swan Falls Data and Research Program Status Report by Idaho Technical Committee on Hydrology. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway, C.E. and C.W. Robinson. 1987. Evaluation of Closed Conduit Measuring Devices for Irrigation Diversions. Research Technical Completion Report, University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway, C.E. and C.W. Robinson. 1987. Pump System Evaluation Using Microprocessor-Based Monitors. American Society of Agricultural Engineers, Paper No. 87-3502. Presented at the ASAE International Winter meeting December 15-18, 1987, Chicago, IL, December 1987.

Brockway, C.E. 1987. Report on "Evaluation of the Idaho-USGS Cooperative Water data Collection Program: A Report to Ken Dunn, Director of the Idaho Department of Water Resources from the Idaho Technical Committee on Hydrology.

Hill, R.W., C.E. Brockway, et al. 1987. Duty of Water under Bear Rive Compact: Field Verification of Empirical Methods. Summer 1987 Progress Report o the Bear River Commission.

- Robinson, C.W. and C.E. Brockway. 1987. Demonstration of Monitors for Pumping Stations. Research Technical Completion Report for the Idaho Department of Water Resources, Contract No. DWR-86-03-21-704-37. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
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- Robinson, C.W. and C.E. Brockway. 1987. Demonstration of Monitors for Pumping Stations. Research Technical Completion Report, Contract No. DWR-86-03-21-704-37. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Brockway, C.E. and C.W. Robinson. 1988. Development and Demonstration of Pump Station and Surface Diversion Monitor Systems for Water and Energy Efficiency Improvements. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Brockway, C.E. and C.W. Robinson. 1988. Water Resources Data and Management Model for Beaver Creek, Camas Creek and Mud Lake Area of Eastern Idaho. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Hill, R.W., C.E. Brockway, R.D. Burman, L.N. Allen, and C.W. Robinson. 1989. Field Verification of Empirical Methods for Estimating Depletion; Research Report 125; Utah Agricultural Experiments Station, Logan, Utah, Two Volumes.
- Brockway, C.E. 1989. Mud Lake Standing Operating Procedures. Draft Operating Procedures Manual for Mud Lake Water Users and Water District 31.
- Robinson, C.W., C.E. Brockway, T. Gray, and T. Henschield. 1990. Irrigation Water Allocation System for Bell Rapids Mutual Irrigation Company.
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- Hamilton, B. and C.E. Brockway. 1991. Effects of Non-Continuous Turnout Operation on the Aberdeen-Springfield Canal System. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Sandoval, V.B. and C.E. Brockway. 1991. Ground-Water Investigations for the Fremont-Madison Irrigation District, Southeastern Idaho. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.
- Sandoval, V.B. and C.E. Brockway. 1992. Water Rights Accounting on the Upper Snake River, Water District 01, Southeastern Idaho. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID. In press.
- Brockway, C.E. and C.W. Robinson. 1992. Middle Snake River Water Quality Study, Phase I: Final. Technical Completion Report Submitted to Idaho Department of Health

and Welfare, Division of Environmental Quality. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway, C.E., C.W. Robison, G.S. Johnson. 1992. Evaluation of Water Quality in Shallow Ground-Water Systems. Final Report to the Division of Environmental Quality, Contract No. 82-600945. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Robison, C.W. and C.E. Brockway. 1991. Operations Manual for Electronic Pumping System Monitors. Research Technical Completion Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Robison, C.W. and C.E. Brockway. 1992. "Thinking about Post-Project Evaluation START NOW!" in: Proceedings of the National RCWP Symposium – 10 Years of Controlling Agricultural Nonpoint Source Pollution: the RCWP Experience. Orlando, Florida. September 13-17, 1992. US-EPA Office of Research and Development Office of Water, Washington DC. EPA/625/R-92/006.

Brockway, C.E., H. Neibling, C.W. Robison, S.J. Trundy, and A. Wetzstein. 1992. Water Quality Project, Twin Falls and North Side Canal Companies First Quarterly Report, June 1-September 30, 1992.

Brockway, C.E., H. Neibling, C.W. Robison, S.J. Trundy, A. Wetzstein, and J.F. Hansen. 1992. Water Quality Project, Twin Falls and North Side Canal Companies Second Quarterly Report, October 1 through December 31, 1992.

Brockway, C.E. and C.W. Robison. 1992. Middle Snake River Water Quality for Snake River at Star Falls. Submitted to B and C Energy. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway C.E. and C.W. Robison. 1992. Middle Snake River Water Quality for Kanaka and Boulder Rapids. Submitted to L.B. Industries. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

Brockway, C.E., H. Beibling, and C.W. Robison. 1993. Water Quality Project, Twin Falls and North Side Canal Companies Third and Fourth Quarterly Report, January 1, 1993 to June 30, 1993.

Brockway, C.E. et al. 1993. Proposed Nutrient Management Plan for Middle Snake Irrigated Agriculture. Submitted to Idaho Department of Health and Welfare Division of Environmental Quality by the Mid Snake Irrigation Water Quality Coordination Committee.

Carter, D.L., C.E. Brockway, and K.K. Tanji. 1994. Controlling Erosion and Sediment Loss from Furrow-Irrigated Cropland. Journal of Irrigation and Drainage Engineering, American Society of Civil Engineers. 119(6):975-988.

Brockway, C.E. and A. Kahlown. 1994. Big Wood River-Silver Creek Hydrology Study. Quarterly Reports.

Brockway, C.E. and A. Kahlow. 1994. Hydrologic Evaluation of the Big Wood River and Silver Creek Watersheds. Phase I. Final Report. University of Idaho, Idaho Water Resources Research Institute, Moscow, ID.

**Charles E. Brockway, Ph.D., P.E.**

List of expert testimony in last 4 years

*Clear Springs Foods Inc.*  
Eastern Snake Plain Aquifer water call

*Clear Springs Foods Inc.*  
Water Call Hearings

*Rangen Inc.*  
Water Call Hearings

*City of Boise*  
Water Right Hearing – Water Treatment - IDWR

*Flying Heart Subdivision HOA*  
Water Right Hearings – IDWR

*Eccles Window Rock Ranch*  
Water Right Hearing – IDWR

*Pioneer Irrigation District*  
District Court

Peer-reviewed publications in last 10 years

None

## **CHARLES G. BROCKWAY, Ph.D., P.E.**

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### **EDUCATION**

- 1992-1995 Iowa Institute of Hydraulic Research  
University of Iowa, Iowa City, Iowa.  
Ph.D., Civil and Environmental Engineering  
Research was conducted under the Hunter Rouse Scholarship,  
leading to the doctorate granted in December 1995.
- 1989-1992 University of Idaho, Moscow, Idaho.  
B.S., Civil Engineering
- 1988-1989 Northwest Nazarene College, Nampa, Idaho. Major: Physics.

### **EXPERIENCE**

#### **Professional**

Managing Member, Brockway Engineering, PLLC  
August 1995 to present. Areas of particular expertise include:

- Computer modeling of water resources systems
- Hydraulic, hydrologic, and environmental evaluations
- Statistical analysis and stochastic modeling
- Irrigation systems and crop water requirements
- Water conveyance and control system analysis and design
- Rainfall-runoff and flood plain-floodway analysis
- Idaho and western states water right transactions
- Economic analysis of water resources systems

#### **P.E. Registrations: Idaho, Wyoming, Nevada**

#### **Research**

Graduate research: Quantitative assessment of the  
uncertainties associated with hydrologic reconstructions in  
augmenting historical information about low-flow phenomena.  
Dr. A. Allen Bradley, Iowa Institute of Hydraulic Research,  
University of Iowa.

Undergraduate research: Leak detection in long oil pipelines  
under transient conditions  
Dr. C. P. Liou, University of Idaho.

### **HONORS and AWARDS**

University of Idaho Alumni Award for Excellence, 1992  
Outstanding Senior Civil Engineering Student, 1992  
Tau Beta Pi member  
Phi Kappa Phi member  
Golden Key National Honor Society member  
National Dean's List member  
Hunter Rouse Fellow, University of Iowa, 1992 - 1995

### **ACADEMIC PUBLICATIONS**

- Brockway, C. G. and A. Allen Bradley (1995). Errors in streamflow drought statistics reconstructed from tree ring data. *Water Resources Research*, 31(9), 2279-2293.
- Brockway, C. G. (1995). An evaluation of streamflow reconstructions for estimation of drought statistics. Ph.D. Thesis, University of Iowa, Iowa City, Iowa.
- Brockway, C. G. and A. Allen Bradley (1996). Errors in reconstructed streamflow drought statistics. *13th Conference on Probability and Statistics in the Atmospheric Sciences*, American Meteorological Society.
- Liou, C.P., C. G. Brockway, and R. B. Miller (1991). Pipeline variable uncertainties and their effects on leak detectability. *1992 API Cybernetics Symposium*, Houston, Texas.

### **OTHER PUBLICATIONS**

Dr. Brockway is the author or co-author of over 100 technical publications related to consulting services performed in the hydraulics, hydrology, and water resources fields. A listing can be provided upon request.

### **GRADUATE RESEARCH**

*Research was conducted at the Iowa Institute of Hydraulic Research under the Hunter Rouse scholarship. A brief summary of the main emphasis of the work is provided here.*

Observed records of hydrologic variables such as streamflow are generally too short to yield reliable estimates of the characteristics of extreme events such as prolonged drought or large-scale temperature anomalies. In an effort to augment observed records, analysts have employed paleologic indicators such as the growth rings of trees, ice core composition, and sediment deposition characteristics as proxies for the desired hydrologic variable. If the paleologic information can be related to observed hydrologic information, a reconstruction of the hydrologic variable can be created for many years past.

Although reconstructions have been used frequently to make inferences about past drought or wet periods, or past temperature anomalies, time series statistics estimated from a reconstructed record are inherently more uncertain than those estimated from an observed record; they may be biased or have inflated standard error of estimation. This and other problems make records augmented with paleologic information less useful than they may appear.

The stochastic technique of Monte Carlo simulation was employed to investigate the usefulness of reconstructed hydrologic records. The estimation standard error and bias of important drought statistics was examined both in absolute terms and relative to expected uncertainty when an observed record is used. Uncertainty is dependent on the error in the reconstruction model, the length of data used to calibrate the model, the degree of autocorrelation present in the time series, and other factors. The phenomenon of "artificial smoothing" was identified and can lead to large biases in the estimated variance and other statistics. The presence of such bias may have led to erroneous conclusions about shifts in climate patterns by some users of hydrologic reconstructions. A Monte-Carlo processing technique was developed which greatly reduces estimation biases and should be used whenever statistics are estimated from a reconstruction.

## **AREAS OF EXPERTISE AND PRACTICE**

### **Computer Modeling**

Development, testing, and implementation of computer models for deterministic and stochastic analysis of hydraulic and hydrologic systems, both surface water and groundwater.

### **Groundwater Evaluations**

Data collection, evaluation, and analysis of groundwater flow systems and contaminant transport.

### **Hydraulic Analysis and Design**

Design and analysis of canal diversion and regulation structures, water measurement structures, spillways, pipelines, culverts, aqueducts, canals, pumping stations, surge-control devices, groundwater wells, irrigation systems, pipeline networks, municipal distribution systems.

### **Land Application of Wastewater**

Evaluation and design of all aspects of wastewater treatment by land application, including hydrogeologic analysis and modeling, parameter loading analysis, environmental impact evaluation, system management and design, and permit acquisition and compliance.

### **Stream Bank Protection**

Analysis of sedimentation and meander pattern evolution in natural waterways, both mountainous and low-gradient. Design of bank stabilization and protection structures. Design of river management projects including flood channel restoration, natural gravel bar removal, drop structures, and sills.

**Water Rights Evaluations**

Hydrologic analysis and transaction preparation for water right permits and transfers in compliance with current state policies, rules, and statutes. Crop evapotranspiration determination, climatic analysis; statistical analysis of climate and crop use variables; water requirements evaluations for irrigation, domestic, commercial, and industrial applications; consumptive use determination; field investigations, measurement and analysis of diversion capacity and water requirements.

**Flood Analysis and Control**

Estimation of flood-frequency relationships in natural and man-made drainages using statistical and deterministic approaches. Hydraulic analysis and computer modeling of waterways to predict water surface elevations and extent of inundation during flood events. Design of flood control structures and bank protection structures.

**Water Demand and Sufficiency Analyses**

Analysis and determination of water supply suitability, source development feasibility, and other factors affecting water supplies for municipalities, residential developments, and industry.

**Hydrography**

Discharge measurements in open-channels and closed-conduits using current meters, in-pipe impeller and propeller meters, and non-intrusive ultrasonic meters.

**Charles G. Brockway, Ph.D., P.E.**

January 14, 2015

List of expert testimony in last 4 years

*Parkinson Farms Application for Transfer*

Hearing #1. Water right transfer administrative hearing pertaining to a transfer application in the Big Lost River valley – testimony regarding well pumping impacts, aquifer water balance, hydrologic impacts on surface and groundwater resources, water availability trends.

Hearing #2. Second hearing on remand from Director – testimony regarding historic and recent aquifer conditions, further testimony on groundwater modeling and impact of pumping on surface water quantity and timing.

*Preston-Whitney Irrigation District Application for Transfer*

Water right transfer hearing – testimony regarding water right structure, historic water and enlargement, and hydrologic impacts of transfer.

## G. Erick Powell, Ph.D., P.E.

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### Education

<u>Degree</u>	<u>University</u>	<u>Field</u>	<u>Year</u>
Ph.D.	The Ohio State University Advisor: Dr. Andrew D. Ward Title: <i>Evaluating geomorphology and water quality of channel-forming discharges in Ohio headwater streams</i>	Agricultural Engineering	2006
MS	Brigham Young University Advisor: Dr. E. James Nelson Title: <i>Bathymetry delineation and data collection preparing a CE-QUAL-W2 model on Scofield Reservoir, Utah</i>	Civil and Environmental Engineering	2002
BS	Brigham Young University	Major: Civil and Environmental Engineering Minor: Agronomy	2001

### Teaching Experience

Adjunct Professor 2008 – Present  
Department of Physical Science  
College of Southern Idaho

<u>Course</u>	<u>Title</u>
GEOG 100	Physical Geography

Adjunct professor for the College of Southern Idaho for physical geography, general education science course focusing on atmosphere, lithosphere, hydrosphere, and biosphere and the human interaction with these environmental spheres.

Graduate Teaching Associate 2002 – 2006  
Department of Food, Agricultural, and Biological Engineering  
The Ohio State University, Columbus, Ohio

<u>Course</u>	<u>Title</u>
ACSM 370	Principles of Hydrology
FABE 373	Principles of Soil and Water Engineering
FABE 673	Design of Agricultural Water Management Systems
FABE 773	Engineering Soil-Water Management
FABE 850	Departmental/Graduate Seminar

Departmental teaching appointment. Recipient of the Stanely W. Joehlin graduate teaching award 2002-2005. Provided instruction for multiple University sponsored workshops.

Instructor 1999 – 2002  
Civil and Environmental Engineering Department  
Brigham Young University, Provo, Utah

<u>Course</u>	<u>Title</u>
CE En 113	Engineering Measurements

Responsible for course instruction, material evaluations, laboratory curriculum development and laboratory instruction.

### Professional Experience

Project Engineer 2006 – Present  
Brockway Engineering, PLLC  
Twin Falls, Idaho

Project Engineering on hydrologic and hydraulic engineering design tasks, including: well design, well construction, well testing, water rights, water right transfers, pipeline design, water distribution systems, stream channel evaluation, floodplain assessment, irrigation water demand, and potable water demand.

Graduate Research Assistant 2002 – 2006  
Department of Food, Agricultural, and Biological Engineering  
The Ohio State University, Columbus, Ohio

Research consisting of: 1) evaluation of channel forming discharges, 2) two-stage channel design procedures, 3) nutrient performance within two-stage agricultural channels, and 4) theoretical nutrient spiraling under restored riparian projects.

Civilian Contractor Summer 2001  
Coastal and Hydraulics Laboratory  
Waterways Experiment Station  
United States Army Corps of Engineers, Vicksburg, Mississippi  
Developed numerical groundwater flow simulations using FEMWATER and Groundwater Modeling System (GMS).

Surveyor and Draftsman 1998 – 1999  
Western Land Surveying, Provo, UT  
Chief draftsman and assistant surveyor for Western Land Surveying.

Laboratory Research Assistant 1993 – 1995  
KSU Soil Testing Laboratory  
Kansas State University, Manhattan, KS  
Soil laboratory and research assistant.

## **Professional Licenses**

State of Idaho, Professional Engineer No. P-13592, December 2008

State of Utah, Engineer in Training, December 2000

## **Professional Associations**

American Society of Civil Engineers (ASCE)

American Ecological Engineering Society (AEES)

American Society of Agricultural and Biological Engineers (ASABE)

American Society for Engineering Education (ASEE)

Alpha Epsilon (ASABE Honor Society)

## **Current Research Interests**

Reconciling water shortage with available water resources involving surface and subsurface storage

Development and application of natural stream concepts to engineering designs

Evaluating hydrologic and sediment response from land and channel improvements

Determining geomorphic influence on water quality and development of management practices for fluvial systems

Investigating sediment sources and deposition within fluvial channels, lakes, and reservoirs

Characterizing geomorphic development of riverine floodplain

Designing engineering systems using channel-forming discharges, sediment transport, and floodplain criteria

## **Professional Service**

ASABE reviewer for soil and water publications

NRI grant reviewer

Assisted associate ASABE editor on peer-reviewed publications

ASABE Soil and Water Committee member

Ohio Agricultural Research Development Center (OARDC) grant reviewer

Reviewed Environmental Hydrology Textbook

## **Relevant Leadership Experience**

The Ohio State University's College of Engineering Academic Affairs Committee member representing graduate students

Department of Food, Agricultural, and Biological Engineering Graduate Student President.

Department of Food, Agricultural, and Biological Engineering Graduate Student Treasurer.

## **Publications**

- Powell, G.E., A.D. Ward, D.E. Mecklenburg, and A.D. Jayakaran. 2007. Two-stage channel systems: Part 1, a practical approach for sizing agricultural ditches. *J. of Soil and Water Conservation*. 62(4):pp.
- Powell, G.E., A.D. Ward, D.E. Mecklenburg, J. Draper, and W. Word. 2007. Two-stage channel systems: Part 2, case studies. *J. of Soil and Water Conservation*. 62(4):pp.
- Powell, G.E. 2006. Examination, application, and evaluation of geomorphic principles and resulting water quality in Midwest agricultural streams and rivers. The Ohio State University. Doctoral dissertation.
- Powell, G.E., D. Mecklenburg, and A.D. Ward. 2006. Evaluation of Channel-Forming Discharges: A Study of Large Rivers in Ohio. *Trans. of ASABE*. 49(1):35-46.
- Martin, J.F., S.A. Diemont, G.E. Powell, M. Stanton, and S. Levy-Tacher. 2006. Emergy evaluation of the performance and sustainability of three agricultural systems with different scales and management. *Agriculture, Ecosystems, and Environment*. 115(2006):128-140.

## **Books and Book Chapters**

- Powell, G.E. 2004. *Solutions Manual for Environmental Hydrology: Second Edition*. CRC Press. Boca Raton, Florida.
- Jayakaran, A., A. Ward, D. Mecklenburg, G.E. Powell, and J. Witter. 2009. Chapter: The Fluvial Functioning of Agricultural Ditches and the Implication for their Management. *Agricultural Drainage Ditches: Mitigation Wetlands of the 21<sup>st</sup> Century*. Revisions made, Pending Publication.

## **Presentations, Papers and Posters**

- Powell, G.E., C.E. Brockway, C.G. Brockway, and Z. Latham. 2009. Spring Source Streams in Idaho. ASABE Annual International Meeting. Reno, Nevada.
- Powell, G.E., J. Draper, and A. Ward. 2006. Crommer Ditch: A Collaborative Evaluation of an Alternative Drainage Channel Design in the Midwest. 2006 Soil and Water Conservation Society international conference. Keystone, Colorado.
- Powell, G.E., D. Mecklenburg, and A. Ward. 2006. Spreadsheet Tools for River Evaluation, Assessment, and Monitoring: The STREAM Diagnostic Modules. 2006 EWRI Congress. ASCE Specialty Conference. Omaha, Nebraska.
- Powell, G.E., A. Ward, and A. Jayakaran. 2006. Nutrient loads in Ohio Headwater Streams. 2006 National Water Quality Conference. USDA-CSREES. San Antonio, Texas.

- Powell, G.E., J.R. Christensen, and W.J. Mitsch. 2005. Riparian Forest Soil Examination for Hydric Soil Conditions following partial dike removal. In: Mitsch, W.J., (Ed.), ORW at OSU, Annual Report 2004.
- Powell, G.E., J.F. Martin, and G.M. Powell. 2004. Comparing the Sustainability of Corn Production by Furrow and Center Pivot Irrigation. 2004 ASAE Annual meeting. Paper Number 042282.
- Powell, G.E., and J. Witter. 2003. Hope Clay Mine Reclamation Project Poster. 2003 STREAMS Conference. Columbus, Ohio.
- Ward., A.D, D. Mecklenburg, G.E. Powell, A.D. Jayakaran, and L.C. Brown. 2004. Two-Stage Channel Design Procedures. 2004 ASAE Specialty Conference. STREAMS Conference. St. Paul, MN
- Ward., A.D., J. Witter, and G.E. Powell. 2004. Water Quality Benefits of Grassed Fluvial Features in Drainage Ditches. 2004 ASAE Specialty Conference. STREAMS Conference. St. Paul, MN
- Ward., A.D., V. Bouchard, B. Songen, G.E. Powell, and A.D. Jayakaran. 2004. Two-Stage Ditch Poster. 2004 ASAE Specialty Conference. STREAMS Conference. St. Paul, MN
- Ward, A.D, D. Mecklenburg, G.E. Powell, L.C. Brown, and A.D. Jayakaran. 2003. Designing Two-stage Agricultural Drainage Ditches. 2003 ASAE Annual Meeting. Paper Number 701P0304.

## References

- |                    |                                     |   |
|--------------------|-------------------------------------|---|
| Dr. Jim Nelson     | jimn@byu.edu<br>(801) 422-7632      | Brigham Young University<br>242D Clyde Building<br>Provo, Utah 84602                    |
| Dr. Andy Ward      | ward.2@osu.edu<br>(614) 292-9354    | The Ohio State University<br>590 Woody Hayes Drive<br>Columbus, Ohio 43210              |
| Dr. Keith L. Smith | smith.150@osu.edu<br>(614) 292-6181 | The Ohio State University<br>2120 Fyffe Road<br>Room 3 Ag Admin<br>Columbus, Ohio 43210 |
| Dr. Larry Brown    | brown.59@osu.edu<br>(614) 292-3826  | The Ohio State University<br>590 Woody Hayes Drive<br>Columbus, Ohio 43210              |

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## **RESUME**

**David Shaw, Engineer/Principal**

### **EDUCATION**

M.S. 1972, Agricultural Engineering, University of Idaho

B.S. 1966, Agricultural Engineering, University of Idaho

### **CERTIFICATIONS AND AFFILIATIONS**

National Council of Examiners for Engineering and Surveying, NCEES #16269

American Society of Agricultural and Biological Engineers

U.S. Committee on Irrigation and Drainage

Idaho Society of Professional Land Surveyors

Idaho Certified Water Right Examiner

Oregon Certified Water Right Examiner, #74051WRE

### **LICENSURE**

Professional Engineer and Land Surveyor, Idaho, #2648

Professional Engineer, Oregon, #74051PE

Professional Engineer, Arizona, #40134

Professional Engineer, Colorado, #415169

### **BACKGROUND**

David is an engineer and principal in the Denver-based natural resources consulting firm of ERO Resources Corporation (ERO). For 17 years, David has managed ERO's Idaho office. He specializes in the identification, analysis, and resolution of water issues including coordination with other professionals in multidisciplinary projects. David has more than 35 years of experience and expertise in water resources and management, covering a broad spectrum of disciplines including surface and ground water supply and use studies, water right evaluations, water quality evaluation and monitoring, project management, alternative dispute resolution, litigation support and expert witness testimony, and technical input on legislative and administrative matters.

### **SUMMARY OF EXPERIENCE**

#### ***Water Right Investigations***

For 11 years, acted as project manager for IDWR's role in the SRBA. An understanding of water rights and management ability were essential for the successful development of the criteria and process for the identification and evaluation of 170,000 claims to water rights. David continues to assist clients with water right investigations including adjudication and administrative processing, evaluation and transfer, and the development of new rights and protection of senior rights.

***Litigation Support and Alternative Dispute Resolution***

Designated as an expert in water right adjudications by the SRBA court. Provides expert testimony before the court on all aspects of water right adjudications as well as hydrology and water right administration issues. Provides expert testimony and settlement support for storm water conflicts and right-of-way issues between water users and nonwater users.

***Water Supply Evaluations, Development, and Permitting***

Assists clients with the permitting and development of water uses. A water supply evaluation is required for most new water right filings and for many filings for changes. Delivery system designs are sometimes included with the development and supply evaluations.

***Water Quality Evaluation, Monitoring, and Management***

Experienced in designing and implementing water quality monitoring programs for various water users. This includes knowledge of state standards and Total Maximum Daily Load requirements, and how water users can help protect their water uses with water quality data.

Project Experience:

**Water Right Investigations**

*Surface Water Coalition, ID*

Provided analysis and recommendations for resolution of water delivery call by senior surface water users against junior ground water users. Analyzed historical water distribution practices for delivery of storage and natural flow water to preserve historical enjoyment of the water resource.

*Snake River Basin Adjudication, ID*

Developed criteria and procedures to investigate the existence and extent of tens of thousands of water rights.

*Little Land and Livestock, Inc., ID*

Evaluated water rights for a potential land purchase. Secured new water rights for development of additional land for irrigated agriculture. Provided technical analysis to resolve conflicts between potential new water use and existing water uses.

*Modoc Point Irrigation District, OR*

Determined the extent of water use for irrigation in support of water right claims in the Klamath River Adjudication.

## **Litigation Support and Alternative Dispute Resolution**

### *Office of the Idaho Attorney General, ID*

Designated by the SRBA court as an expert in water right adjudications. Provided mediation support for resolution of federal reserved water rights. Acted as hydrology expert for litigation of federal reserved water right claims.

### *Surface Water Coalition, ID*

Provided mediation support and expert testimony in support of water delivery call by senior surface water users.

### *Settlers Irrigation District, ID*

Provided mediation support and expert testimony to resolve conflict over irrigation district rights-of-way and encroachment from storm water discharge.

### *Middle Fork Lodge, ID*

Provided expert testimony to establish right-of-way for water delivery prior to creation of a wilderness area and designation of the forest.

### *Shoshone-Bannock Reserved Water Right Negotiations, ID*

Acted as co-chair of the state, Indian, federal, and private technical advisory committee.

### *Riddle Ranch, ID*

Served as technical expert/negotiator for resolution of federal reserved water rights of the Duck Valley Indian Reservation.

### *Methow Valley Ditch Users Association, WA*

Analyzed ground water/surface water interaction and supply.

### *Federal Instream Flow Coalition, ID*

Provided mediation support for resolution of federal reserved water rights and Endangered Species Act water demands.

### *Idaho Office of the Attorney General, ID*

Acted as hydrology expert for litigation of federal reserved water rights.

## **Water Supply Evaluations, Development, and Permitting**

### *Idaho Office of the Attorney General, ID*

Evaluated the surface water supply of a river drainage basin for equitable allocation among state law-based water right water users and federal reserved-based water right water users.

### *Surface Water Coalition, ID*

Evaluated the impact of surface water supply by the diversion and use of ground water.

*Idaho Power Co., ID*

Evaluated the impact of the proposed development of the company's water supply for power generation.

*Big Lost River Basin, ID*

Provided expertise regarding the surface and ground water hydrology and the administration requirements for a ground water recharge project.

*District Water Supply, Boise River, ID*

Evaluated the impact of a proposed water right transfer on irrigation. Identified and quantified changes to ground and surface water supply if the transfer was approved.

*City of Coeur d' Alene, ID*

Prepared an application for consolidation of all city water rights to allow for full use of the water rights and development of a new well.

*Federal Instream Flow Coalition, ID*

Evaluated the hydrologic impact of the historical water development in southern Idaho on river flows for Endangered Species Act-listed salmonids.

**Water Quality Evaluation, Monitoring, and Management**

**Pioneer Irrigation District, ID**

Provided project design, implementation, and management for their water quality sampling program.

**Wilder Irrigation District, ID**

Provided project design, implementation, and management for their water quality sampling program.

**Water Users in Owyhee County, ID**

Provided project design, implementation, and management for their water quality sampling program.

Publications, Testimony and Compensation for David B. Shaw  
January 2015

Publications in the Past Ten Years

None.

Testimony in the Past Four Years

In the Matter of Distribution of Water to Various Water Rights Held by or for the Benefit of A&B Irrigation District, American Falls Reservoir District #2, Burley Irrigation District, Milner Irrigation District, Minidoka Irrigation District, North Side Canal Company, and Twin Falls Canal Company before the Idaho Department of Water Resources. (Surface Water Coalition Delivery Call - Methodology)

In Re SRBA, Case No. 39576 Subcase: 29-12052 (Accounting of all Ground Water Rights Entitled to the Protections of Paragraph 29-12052.X.C of the Fort Hall Consent Decree

In the Matter of Application for Transfer No. 78356 (Shekinah Industries); Application for Transfer No. 78355 (Orchard Ranch); Application for Permit No. 63-32499 (Mayfield Townsites); Application for Permit No. 61-12095 (Nevid-Corder); Application for Permit No. 61-12096 (Nevid); Application for Permit No. 63-32703 (Orchard Ranch); Application for Permit No. 61-12256 (Intermountain Sewer and Water); Application for Permit No. 63-33344 (ARK Properties – Mayfield Townsite)

Robin Friend, Dorothea Friend, John McCallum, Teresa McCallum and ARK Properties LLC vs. Nick A. Nettleton and Betty Ann Nettleton, Case No. CV-2013-1197.

Compensation

David Shaw's current billing rate is one-hundred thirty-eight dollars (\$140) per hour.