Peter E. Smith

1. **DATE PREPARED:** March 16, 2008
2. **PRESENT STATUS**: Retired Research Hydrologist, U.S. Geol. Survey, Sacramento, CA
3. **SUMMARY OF RESEACH EXPERIENCE:** Thirty-one years working as a Research Hydrologist for the U. S. Geological Survey in California, Mississippi, and New York specializing in hydrodynamics of estuaries, three-dimensional numerical modeling, mixing in coastal and inland waters, ecological applications of hydraulics, hydroacoustics, watershed hydrology, mathematics, and water quality.
4. **EDUCATION**:

INSTITUTION	MAJOR	MINOR(S)	DEGREE
University of Calif., Davis	Civil and Environmental Engineering	Hydraulics/Fluid Mechanics/Mathematics	Ph.D. (06/97)
Colorado State University	Civil Engineering	Hydraulics	M.S. (05/76)
Villanova University	Civil Engineering	Water Resources	B.S. (05/74)

5. PROFESSIONAL EXPERIENCE:

A. MOST RECENT POSITION:

DATES: From: June, 1, 1983 To: January 3, 2008
PROJECT TITLE: San Francisco Bay-Delta Hydrodynamic Investigations
POSITION TITLE: Project Chief, Research Hydrologist
EMPLOYER: U.S. Geological Survey, California Water Science Center, Placer Hall, 6000 J Street, Sacramento, California 95819-2605
SOURCES OF FUNDING: U.S. Geological Survey (USGS) Cooperative Program
Interagency Ecological Program (IEP) for the San Francisco Bay-Delta Estuary
California Department of Water Resources
U.S. Bureau of Reclamation
California Bay-Delta Authority (CalFed)
California State Water Resources Control Board (SWRCB)
DESCRIPTION OF PROJECT: This project was part of a long-term hydrodynamic study of the San Francisco Bay-Delta Estuary begun by the IEP, USGS, and SWRCB in 1983. The general objective has been to understand biologically important variations in hydrodynamics (water currents and salinity) within the estuary that result from changes in freshwater inflows and the diversions of water by the two large state and federal water projects in the south Delta. One component of the study was to develop a three-dimensional (3D) hydrodynamic computer model and to apply it to studies of the estuary.

MOST RECENT ACTIVITY: Principal investigator on four studies: (1) CalFed-initiated study of South Delta Hydrodynamics and Fish Transport to understand the role of delta flows, circulation, and fish behavior on the transport and entrainment of fish (primarily delta smelt) at the State and Federal pumping facilities in the south Delta; (2) IEP-funded modeling study of the three-dimensional (3D) circulation in San Francisco Bay to understand the density-driven circulation and salt transport in the lower portion of the estuary; (3) IEP-funded modeling study of the 3D circulation in the vicinity of the Delta Cross Channel (DCC) to understand the mechanisms that affect the entrainment of outmigrating juvenile salmon on the Sacramento River into the DCC and Georgiana Slough; (4) CalFed-funded study of Hydrodynamics and Oxygen Modeling of the Stockton Deep Water Ship Channel aimed at understanding what physical and biogeochemical conditions lead to hypoxia in the reach of the San Joaquin River near the City of Stockton, Califronia.

B. PREVIOUS USGS PROFESSIONAL POSITIONS:

- 9/82 to 6/83 -- USGS Graduate School Training Program , University of California, Davis.
- 9/78 to 8/82 – Research Hydrologist with the USGS National Research Program, Bay St. Louis, Mississippi. Research on 1-D unsteady flow and rainfall-runoff modeling. Developed (along with a USGS co-worker) the USGS rainfall-runoff and runoff-quality models called DR3M and DR3M-QUAL.
- 9/76 to 8/78 -- Hydrologist with the New York District of USGS, Albany, New York. Hydraulic analyses for flood insurance studies on several river systems using the USGS WSPRO computer model for steady-state water surface profile computation.

6. RECENT RESEARCH ACCOMPLISHMENTS:

I developed 3D hydrodynamic and particle tracking models for use on the San Francisco Bay-Delta Estuary. The hydrodynamic model, called Si3D (semi-implicit 3D), is a public-domain code that uses a novel numerical formulation that is mass conservative, computationally efficient, and numerically accurate. Although the Si3D model was designed mostly for application to estuaries, it has also been applied succesfully to studies of lakes by the University of California Davis. The particle tracking model, which was programmed in Java (by a computer science co-worker), reads large data files containing space- and time- dependent velocity, water-level, and turbulence data output from the Fortran-based hydrodynamic model. By applying the PTM in a post-processing step rather than in a coupled simulation with the hydrodynamic model, greater flexibility is allowed in conducting multiple experiments for forward or backward tracking of particles under the same hydrodynamic conditions and for interactive visualizations of particle movements.

In the last five years, my research has concentrated mostly on applications of the 3D models to different portions of the Bay-Delta estuary and to studies of Delta ecology. See the studies mentioned above under "Most Recent Activity."

Working with a computer science co-worker, I have also collaborated in the development of new interactive graphic software using the Java language and OpenGL (open graphics library) for use in visualizing 3-D numerical model output and hydrodynamic field data.

7. SCIENTIFIC LEADERSHIP:

- Member (1998-present) of the Computational Hydraulics Committee for the Environmental and Water Resources Institute (EWRI) of the American Society of Civil Engineers (ASCE).
- Member (1990-present) of a task committee for the EWRI of ASCE to prepare a comprehensive monograph on "Verification and Validation of 3-D Free-Surface Hydrodynamic Models." (The monograph from this task committee is being printed by ASCE and will be published in 2008.)
- USGS representative (from 1997-2005) to the Management Team overseeing the Interagency Ecological Program (IEP) of the San Francisco Bay-Delta Estuary. This program involves nine federal and state agencies and over 15 million dollars in funding for monitoring and special studies.
- USGS representative (since 1995) to the Steering Committee of the California Bay-Delta Modeling Forum (Although a member, I am not particularly active on this Committee)
- Advisor (during 2001) to the California Water and Environmental Modeling Forum peer review of 1-D Delta Hydrodynamic Models
- Chairman (from June 1998 to 2004) of the IEP Hydrodynamics Project Work Team.
- On the organizing committee (from 1989 to 2005) for the annual IEP scientific workshop on the San Francisco Bay and Delta held each February at the Asilomar Conference Center in Monterey, CA.
- Led the development of the original USGS hydrodynamic study of San Francisco Bay in the 1980's.

8. SCIENTIFIC AND PUBLIC SERVICE:

A. CURRENT MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Society name: American Society of Civil Engineers (ASCE) (member since 1974)
  Elective Office held: Secretary (1980) and Vice President (1981), Gulf Coast Branch.
  Important committee and leadership assignments:

i. Control member of the Computational Hydraulics Committee for the Environmental and Water Resources Institute (1998 to present)
ii. On the advisory committee of ASCE's prestigious biannual Estuarine and Coastal Modeling Conferences (1989-present)
iii. Control member of a Task Committee to prepare a monograph on "Verification and Validation of 3-D Free-Surface Hydrodynamic Models" (1990 to present).
iv. Corresponding member of a Tidal Hydraulics Task Committee on Intra-Annual Variation in Coastal Water Levels (from 1992-95)

- Society name: American Geophysical Union (AGU) (member since 1979)

- Society name: American Water Resources Association (AWRA) (member since 1982)

B. TECHNICAL PRESENTATIONS AT SCIENTIFIC MEETINGS (LAST 5 YEARS ONLY):

Using 3D Hydrodynamic and Particle-Tracking Models to Simulate Fish Transport and Entrainment Zones in the Sacramento-San Joaquin River Delta, California. (ABST.) September 3, 2007. 137th Annual Meeting of the American Fisheries Society, Marriott Hotel, San Francisco, California.

Hydroacoustic Measurements Used to Calibrate and Validate a 3D Hydrodynamic Model for the Delta Cross Channel Region of the Sacramento River, California. (ABST.) April 4, 2007. USGS National Surface Water and Hydroacoustics Workshop, St. Louis, MO.

Hydrodynamic Clues for Solving the Mystery of the Declining Delta Smelt Poulation in the San Francisco Bay-Delta Estuary. April 3, 2007. (ABST.) USGS National Surface Water and Hydroacoustics Workshop, St. Louis, MO.

Data and Modeling Analyses of the Possible Effects from Entrainment of Delta Smelt on the Population Decline. November 28, 2006. CalFed Workshop on the Environmental Water Account for the Sacramento-San Joaquin Delta, Sacramento, California.

Hydrodynamic Influences on Historical Patterns in Delta Smelt Salvage. (ABST.) October 24, 2006. Biannual CalFed Science Conference, Sacramento Convention Center, Sacramento, California.

Hydrodynamic and Particle Tracking Modeling for the San Francisco Bay-Delta Estuary, California. (ABST.) November 15, 2005. 1st All-USGS National Modeling Conference, Olympic Park Institute, Port Angeles, Washington.

Three-dimensional Hydrodynamic Modeling of the Stockton Deep-Water Ship Channel, California. (ABST.) October 31, 2005. 9th International Conference on Estuarine and Coastal Modeling, ASCE, October 31-November 2, 2005, Charleston, SC.

Applications of 3D Hydrodynamic and Particle Tracking Models in the San Francisco Bay-Delta Estuary. (PAPER.) May 17, 2005. ASCE's 2005 World Water and Environmental Resources Congress, May 15-19, 2005, Anchorage, AK.

A New Look at Suisun Bay Circulation. March 3, 2005. Annual Conference for the Interagency Ecological Program of the San Francisco Bay-Delta Estuary, Asilomar Conference Center, Pacific Grove, CA.

Three-dimensional Hydrodynamic Modeling of the Stockton Deep Water Ship Channel. March 2, 2005. Annual Conference for the Interagency Ecological Program of the San Francisco Bay-Delta Estuary, Asilomar Conference Center, Pacific Grove, CA.

Influence of Horizontal Momentum Diffusion on 3D Hydrodynamic Simulations of the Sacramento-San Joaquin River Delta. (ABST.) March 1, 2005. Annual Workshop of the California Water and Environmental Modeling Forum, Asilomar Conference Center, Pacific Grove, CA.

Computation of the Daily Value for Publication at USGS Tide-Affected Discharge Monitoring Stations. March 25, 2004. USGS National Hydroacoustics Workshop, San Diego, California.

Use of Acoustic Doppler Current Profilers in 3D Model Studies of the San Francisco Bay-Delta Estuary. March 23, 2004. USGS National Hydroacoustics Workshop, San Diego, California.

Three-dimensional Lagrangian Residual Circulation in San Francisco Bay. (ABST.) Annual Wokshop of the California Water and Environmental Modeling Forum. February 25, 2004, Asilomar Conference Center, Pacific Grove, CA.

Three-dimensional Hydrodynamic and Particle Tracking Modeling of the San Francisco Bay and Delta. November 19, 2003. USGS National Surface Water Conference, San Antonio, Texas.

Three-dimensional Particle Tracking in the San Francisco Bay and Delta. (ABST.) 8th International Conference on Estuarine and Coastal Modeling, November 3-5, 2003, Monterey, CA.

Applications of 3D Hydrodynamic and Particle Tracking Models to the San Francisco Bay and Delta. February 26, 2003. Annual Conference for the Interagency Ecological Program of the San Francisco Bay-Delta Estuary, Asilomar Conference Center, Pacific Grove, CA.

C. RENDERING SCIENTIFIC JUDGEMENT:

- I have served as an invited speaker on the following panel discussions at professional society conferences:

i. Panel Discussion on 'Integrated Modeling and Hydraulic Engineering.' ASCE 2005 World Water and Environmental Resources Congress, May 15-19, 2005, Anchorage, Alaska.
ii. Panel Discussion on an 'ASCE Monograph for 3D Free-Surface Flow Model Verification and Validation.' ASCE 2001 World Water and Environmental Resources Congress, May 21,2001, Orlando, FL.
iii. Panel Discussion on 'Free Surface Flow Model Verifications.' ASCE 1998 Int'l Water Resources Engineering Conf., August 4, 1998, Memphis, TN
iv. Panel Discussion on 'Three-Dimensional Free Surface Flow Modeling.' ASCE First Int'l Conf. on Water Resources Engineering. August 18, 1995, San Antonio, TX.
v. Panel Discussion on '3-D Hydrodynamic Model Validation.' Plenary session of the Int'l Conf. on Hydroscience and Engineering. June 8, 1993, Washington, D.C.

- I have been a regular reviewer for the editors of the Journal of Hydraulic Engineering, Journal of Environmental Engineering, and the International Journal of Numerical Methods in Fluids.

D. LECTURESHIPS AND OTHER ACADEMIC SERVICE:

University of California, Davis. Hydrodynamic clues for solving the mystery of the declining delta smelt poulation in the San Francisco Bay-Delta Estuary. January 8, 2007. (Department of Civil and Environmental Engineering, Water Resources Engineering seminar series)

U.S. Geological Survey. 3D simulations of flow in the Delta Cross Channel Region of the Sacramento River with implications for fish passage. April 27, 2006. (USGS Western Region Office, Water Resources Research seminar series, Menlo Park, California)

University of California, Davis. Some experiences and lessons learned with computational hydraulics in the USGS. December, 9, 2004. (Lecture to graduate-level class on Computational River Mechanics I)

University of California, Davis. Three-dimensional hydrodynamic and particle-tracking modeling of the San Francisco Bay and Delta. May 10, 2004. (Department of Civil and Environmental Engineering, Water Resources Engineering seminar series)

University of California, Davis. A 3-D finite difference model for circulation in estuaries. April 21, 1998. (Department of Civil and Environmental Engineering, Water Resources Engineering seminar series)

University of Virginia, Charlottesville. Hydrodynamic measurements and modeling of the San Francisco Bay-Delta Estuary. October 24, 1997. (Seminar series for the Department of Civil and Environmental Engineering)

California State University, Sacramento. Hydrodynamic measurements and modeling of the San Francisco Bay-Delta Estuary. October 14, 1997. (USGS/ Geology Department Colloquium)

University of California, Berkeley. The effects of freshwater inflow on circulation and mixing in San Francisco Bay. March 2, 1992. (Seminar for the Department of Civil Engineering)

Stanford University. Three-dimensional hydrodynamic modeling of San Pablo Bay, California. May 21, 1990. (Seminar for the Department of Civil Engineering)

University of California, Davis. Hydrodynamic modeling of San Francisco Bay. February 7, 1990. (Department of Civil Engineering, Water Resources Engineering seminar series)

University of New Orleans. Hydraulic routing of surface runoff. May, 1980. (Classroom lecture)

E. TECHNICAL TRAINING PROVIDED:

I lectured at the following training workshops provided to the USGS:

Workshop on Computation of the Daily Mean for Tidally Affected Data. USGS National Surface Water and Hydroacoustics Conference, St. Louis, MO. April 2, 2007.

Workshop on Unsteady Flow and Transport in Rivers and Estuaries. University of North Carolina, Chapel Hill, NC. April 2-4, 1991.

Western Region Surface Water Modeling Workshop. Portland, OR. Oct. 31-Nov 2, 1989.

Estuarine Modeling Workshop. Reston, VA. May 2, 1988.

Western Region Surface Water Seminar. April 19-22, 1982.

Southeast Region One- and Two-dimensional Flow and Sediment Modeling Workshop. Bay St. Louis, MS. April 12-16, 1982.

Watershed Systems Modeling Workshop. USGS National Training Center, Denver, CO. Two week course, 198l.

USGS NY District Watershed Modeling Workshop. Albany, NY. August 11-13, 1981.

Urban Watershed Modeling Workshop. USGS National Training Center, Denver, CO. One and a half week course, 1980.

Urban Hydrology Workshop. USGS National Training Center, Denver CO. Four day course, 1980.

Stormwater Modeling Workshop. Bay St. Louis, MS. June, 1979.

9. OUTREACH AND INFORMATION TRANSFER:

I collaborated with a computer science colleague (John Donovan) in the development of useful visualization program for hydrodynamic modeling and field data (see the URLs: http://ca.water.usgs.gov/program/sfbay/gr/ and http://ca.water.usgs.gov/program/sfbay/vpv/)

10. HONORS, AWARDS, RECOGNITION, ELECTED MEMBERSHIPS:

- Honorable Mention from the National University Council on Water Resources for the 1998 Award for Outstanding Water Resources Dissertation in the Field of Water Processes
- Registered Professional Engineer
- USGS Special Achievement Awards 1989, 1990, and 1992-94
- USGS Graduate School Training Program, 1982-83
- Member, Tau Beta Pi National Engineering Honor Society

11. BIBLIOGRAPHY:

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McCutcheon, S.C., and Smith, P.E., 198l, Discussion of "Pollutant concentrations from homogeneous land uses," by Irwin Polls and Richard Lanyon, 1980 (*in* Journal of the Environmental Engineering Division, American Society of Civil Engineers, v. 106, no. 1, p. 69-80): Journal of the Environmental Engineering Division, American Society of Civil Engineers, v. 107, no. 1, p. 29l.

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Alley, W.M., and Smith, P.E., 1982, Multi-event urban runoff model, user's manual: U.S. Geological Survey Open-File Report 82-764, 169 p.

Guay, J.R., and Smith, P.E., 1988, Simulation of quantity and quality of storm runoff for urban catchments in Fresno, California: U.S. Geological Survey Water-Resources Investigations Report 88-4125, 76p.

Smith, P.E., and Larock, B.E., 1989, High resolution two-dimensional advective transport, *in* Proceedings of the 1989 National Conference on Hydraulic Engineering: New Orleans, La., August 14-18, 1989, American Society of Civil Engineers, p. 1005-1010

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Smith, P.E., and Larock, B.E., 1993, A finite-difference model for 3-D flows in bays and estuaries, *in* Proceedings of the 1993 National Conference on Hydraulic Engineering: San Francisco, Calif., July 25-30, 1993, American Society of Civil Engineers, v. 2, p. 2116- 2122.

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